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TACTICAL AND TECHNICAL TRENDS

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By

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TACTICAL AND TECHNICAL TRENDS AND DEVELOPMENTS

This bulletin, which will be issued bi-weekly, consists of recent information of tactical and technical developments and trends affecting the operations of the Arms and Services. It is derived from official sources (except where specifically noted), and consists principally of extracts from reports by American Military Attaches and Observers in the field. Comments and evaluations are included where they are pertinent. Information relative to air and naval operations is not included, except where directly related to ground operations.

The material is arranged according to Arms and Services. The sources of information are indicated at the end of each topic discussed. Officers who wish to obtain further information on any subject herein may do so by citing the respective references, the title of article, and the number of the bulletin.

Divisional and higher commanders are invited to submit material for this bulletin, covering the experiences which they have had with the technical problems which have been encountered in connection with materiel issued to their organizations.

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SECTION I

TACTICAL AND TECHNICAL TRENDS

PART I [redacted]

AIR

JAPANESE BOMBING METHODS

A Japanese method in bombing operations is to send a fleet of bombers over the objective and drop no bombs at all. However, these are followed within a short period, from ten to fifteen minutes, by another fleet of bombers which do all the damage.

The Japanese also employ a method known as the "hidden fighter." This consists of an attack by a group of bombers which brings the British planes into the air. Then all but one of the Japanese bombers leave. The remaining bomber lurks in the vicinity behind hills until sufficient time has passed to allow the British fighters to land at their airfield, at which time the Japanese bomber comes out of the shadows and destroys the British planes on the ground. This deceptive method was used very effectively in Singapore, not only in the destruction of buildings but in causing great casualties among the people.

In a recent raid on Port Moresby, five Japanese fighters arrived 90 seconds prior to the appearance of bombers and traced a cross of white smoke. When the bombers appeared, they flew through the center of the smoke pattern and released their bombs approximately 12 seconds afterward.

(No. 363, M. I. S., Headquarters, U. S. F., S. W. Pacific.)

PART II

ANTI-AIRCRAFT

PROBLEMS IN BRITISH ANTI-AIRCRAFT MOUNTINGS

The British anti-aircraft mounting spring support, known as the Lakeman, has been commented on very unfavorably in the British Middle East Command and G.H.Q. The Middle East have stated that they would prefer to do without this support both on tanks and armored cars. British Royal Armoured Corps Headquarters have also been consulted in this matter and a certain divergence of opinion was noted. However, after consideration, it was decided that the Lakeman anti-aircraft mounting is not suitable in the United Kingdom either. The chief complaint, which appears general both in the Middle East and the United Kingdom is the lack of protection for the anti-aircraft gunner.

Note: While these discussions were being carried out, the 8th Armoured Division produced a Valentine Tank with an anti-aircraft mounting designed by a British Officer. This was viewed by the General Staff and British Royal Armoured Corps Headquarters and was found to have very definite possibilities. In consequence of this, the Director of Tank Designs has been requested by the General Staff to investigate the possibility of incorporating this mounting in all tanks and armored cars where possible. It is feared that it may not be possible to use this mounting with vehicles fitted with a cupola. Meanwhile, the Commander of the Royal Armoured Corps has requested that he may retain the present Lakeman anti-aircraft support pending the design and production of the improved mounting.

(M/A Report, London, No. 47672.)

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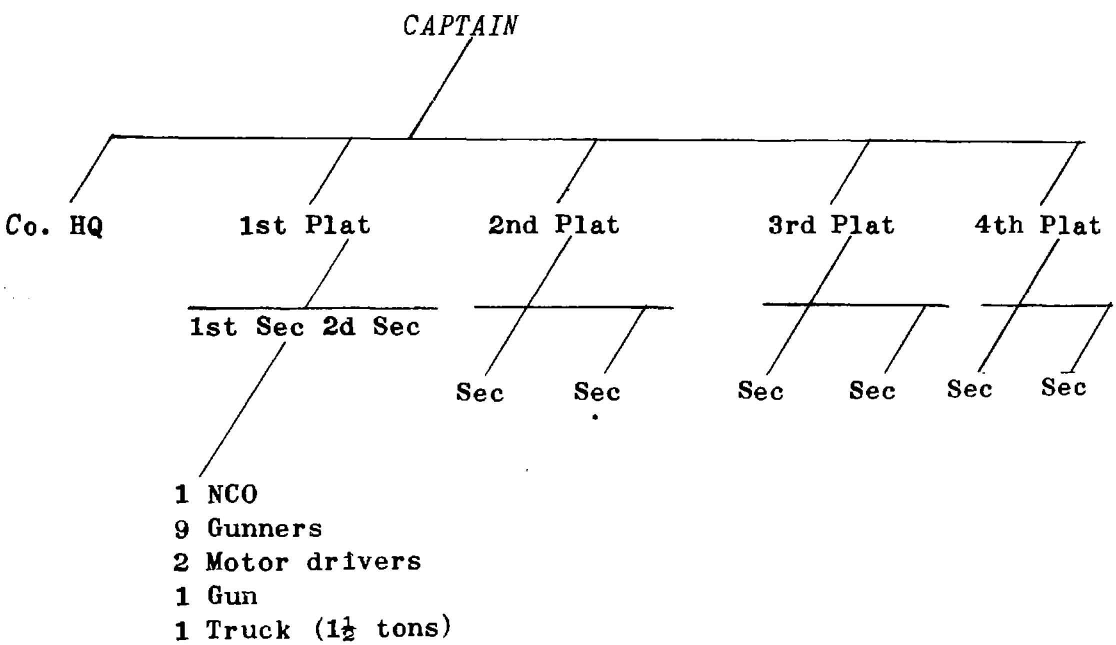
PART III

ANTI-TANK

ORGANIZATION OF JAP ANTI-TANK COMPANY

Following is the composition of a Japanese Independent Anti-Tank Company operating in Burma:

ORGANIZATION.



The total strength of the company is approximately 150.

EQUIPMENT

Eight 37 mm Anti-tank guns. Each gun is carried on a 1½ ton truck. 150 rounds of ammunition are carried in each truck. No motor transport is provided for the men.

TACTICAL EMPLOYMENT

The unit was subdivided in the advance on Rangoon. Two platoons were with the 33rd Division and two with the 55th Division. The two platoons with the 55th Division were to operate with Japanese tanks, but failed to do so because the tanks could not cross the Sittang River in time.

(M/A Report, Burma, No. 173, U.S.M.O.)

GERMAN MINE FIELDS IN LIBYA

German Mine Fields encountered in the Tobruk area are reported to have been, with very few exceptions, combinations of anti-tank and anti-personnel mines.

A row of "Sperrmine" anti-personnel mines, called "S" mines, with push igniters was frequently laid in front of the Teller mines (platter shaped anti-tank mine, weighing about 10 lbs.). This apparently was intended to make the work of taking up the minefield more dangerous.

Trip wires intended to give warning of the approach of hostile troops were also utilized. It is reported that "T" mines are usually laid with the top of the igniter flush with the ground and the earth smoothed back into place. No elaborate concealment has been encountered and the disturbed earth usually makes the mines easy to locate. No pull-igniters have been found in the cavities provided for them in the side and base, of "T" mines although the Germans are known to have used this type of igniter in the area.

In one case a field of "T" mines was found to have been arranged for deliberate firing, and engineer reconnaissance discovered electric leads connected to the arming points in the sides of the mines. They were wired in parallel to enable the mines to be fired singly or in groups.

"S" mines are usually laid with only an inch of the antennae visible, and the disturbed earth carefully smoothed back into place. Nevertheless, the disturbed earth usually makes their location easy, as no elaborate attempt at concealment has been encountered.

Push, pull, and pedal-types of this mine have been encountered, the two former predominating.

(B.M.I., No. 43)

PART IV [redacted]

ARTILLERY UNCLASSIFIED

ARGENTINE MOUNTAIN ARTILLERY TRAINING

A demonstration was given by a 75 mm mountain artillery battery; all the men taking part were of the class of 1920 and therefore had been in the service a little over one year. The exercise was held in the foot hills about two miles west of Mendoza. The terrain in this region is very rough and rocky with no vegetation except cactus and small bushes. There are many steep slopes, slides, and chasms. All pack mules were led by men dismounted. One gun was taken in pack to the top of a hill over a narrow, knife-edge ridge which was so steep that dismounted men assisted the mules by hauling on ropes tied to each side of the packs. This gun was eventually placed in position on top of the hill. Another crew hoisted its loads to the top of a cliff by hand, first using rope ladders for the personnel. The loads were then taken across a deep arroyo on a rope cable with pulleys. The personnel was also crossed in this manner and the gun set up on the other side. It was explained that the rope ladders and cables had previously been placed in order to save time. Nearly every pack carried a coil of heavy rope, and several rope cables were also carried. The battery detachment scaled a nearly vertical cliff on foot in the Alpine style to establish an observation post on a high hill. Communication equipment consists of telephone and radio. All these activities were conducted simultaneously.

Comments by observer: This demonstration is the best I have seen of Argentine army activities. Although rehearsed many times, as could be seen by the appearance of the ground, it presented a true phase of peace-time garrison training. The troops were in their every-day work uniforms and there was a total lack of parade ground atmosphere. The equipment was well worn but kept in serviceable condition. The guns were clean and working parts oiled. All in all, I was very favorably impressed with the efficiency by all ranks.

(M/A Report, Argentina, No. 7809.)

LIQUID AIR IN GERMAN SHELLS

The Germans at Kerch are reported to have used bombs, mortar and artillery shells containing a powerful explosive involving liquid air with evidences of magnesium. The resultant air pressure is reported to cause death by lung collapse, a reaction similar to that of death by gas or asphyxiation. The usual protective measures are said to be worthless due to the large effective radius.

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G-2 Comment:

Due to lack of United Nations observers on the Russian front, no first hand information is available on this subject.

(M/A Ankara, J-33)

CHEMICAL WARFARE

NERVE GAS

Unconfirmed reports from various sources describe the effects of a so-called "Nerve Gas" said to have been used by the Germans in Russia.

(C.W.S. COMMENT: American chemists do not know of any agent which it is practicable to make having the characteristics ascribed to "Nerve Gas." However, because of the persistent rumors that a gas of this type exists, investigations along this line are being continued.)

NEW TYPE OF GERMAN VESICANT REPORTED

Evidence is accumulating that the enemy is manufacturing a vesicant other than mustard (HS) and lewisite (MI). It is almost certain that this substance is of the same type as one which is known to have been the subject of enemy experiments for some time. It appears that one center for the manufacture of this new vesicant is in Poland. At least one new projection device has been captured by the Russians.

Unusual interest in civilian anti-gas defense is also to some extent a seasonal manifestation. The Spring of 1941 saw great activity in Western Germany. It now appears that there is considerable activity in this direction in Berlin, eastern Germany and in Poland.

(M/A Report, London, No. 47531.)

NOTES ON GERMAN CHEMICAL WARFARE

A charred diary taken from the wreckage of an Heinkel III airplane brought down in May, 1941 in the Middle East was found to contain rough notes of a lecture on chemical warfare.

Although for the most part these notes confirmed our previous knowledge of German Chemical Warfare the following entries are worthy of comment:-

(I) Mention is made of toxic smoke and lachrymatory generators - "80% Blue Cross or White Cross." This is the first definite reference to German toxic smoke generators, although their existence has been suspected and samples from the private firm of Stoltzenberg have been examined. They are presumably intimate mixture types in which the toxic charging represents 80% of the total weight of the device.

(II) Under the heading "Gas projectors and gas mines" it is stated that the filling used in "Green Cross and exceptionally, Blue Cross; range 3,500 metres." This range is too high for a projector of the Livens type and may possibly refer to the new German 10 cm. Stokes-brandt type mortar. "Green cross" is the German marking for the lung irritant group of war gasses (i.e. chlorine, phosgene, etc.), while "Blue Cross" is used to denote the arsenical toxic smokes.

(III) Describing gas shell for field artillery, the gas content is given as 10%.

This figure is high and may indicate that high capacity designs for gas shells have been introduced.

(IV) Under the heading of ground contamination methods, a Yellow Cross (mustard) spray mine is mentioned. This may be based on the Czechoslovak "Chema" chemical mine, in which an outer cylinder was used to project the mine into the air where it burst at a predetermined height.

(C.W.S. COMMENT: Permeable protective clothing issued to American soldiers gives all the protection practicable against mustard gas vapor and a large measure of protection against liquid lewisite. It gives protection against the vapor of lewisite but only limited protection against liquid lewisite. Against the so-called nitrogen mustard, American clothing provides rather limited protection against both vapor and liquid. At present, tests and development work now going on indicate that a greater measure of protection can be provided by further chemical treatment of the clothing. Tests have not proceeded far enough at this time to justify definite conclusions. Development is underway, the purpose of which is to provide an impermeable protective cape which will not be penetrated by liquid agents of either of the lewisite mustard or the nitrogen mustard types of agents.

A protective ointment is being issued to American troops which gives protection against Lewisite M1 and Mustard. The results of tests of the protection against nitrogen mustard are not yet available.

Detector papers and paints are being issued to troops which will indicate the presence of liquid mustard, lewisite or nitrogen mustard. A detector kit has been standarized, but not yet issued, which will also detect the presence of the three above described agents.

Rockets - Although the British have issued a rocket type weapon to their chemical warfare troops as a part of their armament, American

chemical warfare troops are not so equipped. Development work is now underway which promises to provide an improved rocket type chemical projector.

Chemical mortar - Tests are now being conducted on the 4.2-inch chemical mortar, the standard for American chemical warfare troops, to increase the maximum range up to approximately 3200 yards as contrasted to the present maximum of 2400 yards. From results so far obtained this seems practicable.

High-explosive shells - A military requirement has been established for a high explosive shell of the 4.2-inch chemical mortar. It is expected that this development will be completed at an early date and production of several hundred thousand of these shells initiated.

Gas mask - The American gas mask will protect against all known gases in the field.)

ENGINEERS

GERMAN STEEL INVASION BARGES

The following is a description, received from Finland, of German steel invasion barges. They are 20 feet wide and 90 feet long, with a flat sloping bow to enable them to run up on the beach. Compartments for personnel and tanks are completely housed and on either side of steel deckhouse there are two exit ports. Guns and vehicles are taken on and off by means of a ramp in the bow.

(M/A, Helsinki.)

NOTES ON BRITISH BRIDGE CONSTRUCTION

The British Engineer-in-Chief, Middle East, reports that as far as he is aware no anti-tank obstacles were met other than anti-tank mines and ditches outside Tobruk. With regard to the latter, during recent operations a Field Company constructed eight class 24 tank bridges (capacity about 25 tons) in one night over an anti-tank ditch 18 feet wide by 8 feet deep. They were constructed of eight reinforced steel joist beams for spanning. 12" x 5" and 4" decking was used. The bank seats were 10" x 10" timber and had been laid a few days previous. The reinforced steel joists were wrapped in hessian (a heavy fabric) to deaden the noise. The first four bridges were completed by 0100 hours and the remainder by 0400 hours.

The officer commanding an Italian infantry regiment, who was taken prisoner, said under interrogation, "The sapper work in putting 8 tank bridges across the anti-tank ditch on the eastern sector was carried out in an impeccable manner. We did not know nor did we hear anything while they were being put across. The first thing we heard or saw were British tanks."

From an operational point of view the bridges were entirely satisfactory.

G-2 COMMENT:

It is believed that this description of British bridging of anti-tank ditches gives an unduly optimistic picture of the ease of the operation. The reference seems to be to the original capture of Tobruk from the Italians. If so, the explanation lies in (a) the fact that the ditch was outside the obstacle (wire and mines) system; and (b) the fact that the Italians, in that campaign, were push-overs.

(M/A Report, London, No. 47672.)

PART VII [redacted]

INFANTRY

ORGANIZATION AND TRAINING OF BRITISH COMMANDOS

Origin.

During the winter of 1939-1940, and prior to the Norway campaign twelve independent volunteer companies, one from each of twelve British divisions were formed. These companies were trained to perform especially hazardous tasks in support of divisional operations. Upon conclusion of the Norway campaign, and in June 1940, these twelve companies were formed into six independent battalions. In February 1941, these were regrouped into eleven commandos which now comprise the Special Service Brigade. Conversation with several officers, indicated that while it was believed that this S.S. Brigade originally should have been comprised of Marines, this was not possible at the time as the Royal Marines were unable to furnish the required personnel.

Missions.

The primary mission of the S.S. Brigade is to carry out raids. Raiding parties may vary in size from a small reconnaissance group to a complete commando or even a larger force. Secondary missions are:

(1) To act as an elite or shock assault brigade to seize and hold a bridgehead to cover a landing in force.

(2) To provide especially trained covering forces for any operation.

Organization.

The S.S. Brigade functions under the Advisor for Combined Operations (A.C.O.). The A.C.O. acts in an advisory capacity to, and executes the orders of, the Chiefs of Staff Committee of the Imperial Defence Council. The staff of the A.C.O. consists of officers of the Army, Navy, Air Force, and Royal Marines. The S. S. Brigade is commanded by a Brigadier who has both an operational and an administrative staff. The Brigade, however, does not train, nor does it function normally as a Brigade, but as separate commandos which are stationed in various parts of the British Isles and abroad. The S.S. Brigade is entirely serviced by the Army.

The commando consists of approximately 25 officers and 450 enlisted men, all of whom are volunteers. The unit is organized into a commando headquarters and six troops. The former consists of seven officers and 77 enlisted men organized into Administrative, Intelligence, Signal, and Transport Sections. In addition there are attached: one

surgeon, seven Royal Army Medical Corps personnel and two Royal Army Ordnance Corps men.

Each troop consists of three officers and 62 enlisted men, organized into a Troop HQS. and two sections. Troop HQS. consists of a Captain (C.O.), a troop sergeant major and an orderly (runner and batman). Each section (1 officer and 30 enlisted men) is commanded by a Lieutenant. The section is composed of two or more subsections (squads) of six to eight men each. Subsections are commanded by sergeants. It will be noted that the section is exactly suitable for boating in one Assault Landing Craft (A.L.L.).

Weapons.

Although the establishment (Tables of Organization) provides a definite allowance and allocation of weapons, neither the numbers of weapons nor their distribution is rigidly adhered to. In every case the distribution of weapons is made according to the tactical requirements of the particular mission to be performed. Each commando HQS. has a separate store of extra weapons and thus extreme flexibility in armament is assured. A typical store contains:

Bren guns; TSMG's; cal. .55 anti-tank rifles; 2" and 3" mortars and a supply of both smoke and HE shell for each; defensive (fragmentation) Mills hand grenades; offensive (plastic body, concussion type) hand grenades, smoke pots; Very pistols; fighting knives; knuckle dusters; limpets (magnetic attaching, acid, H.E.) one type suitable for use against ships and another for use against tanks; demolitions of all types.

The establishment provides the following weapons in addition to rifles and Colt automatic pistols, cal. .45 for each troop:

4 Bren guns
4 TSMG
1 AT rifle, cal. .55
1 2" Mortar

Normally each subsection (squad) is allocated one Bren gun and one TSMG. The allocation of the anti-tank rifle and the 2" mortar is left entirely to the troop commander who employs them according to the requirements of the situation. As indicated above, additional weapons are available in Commando stores and may be assigned. The important point to note is the extreme flexibility in armament and the degree of initiative permitted troop leaders in its distribution.

Clothing and Equipment.

Clothing and equipment furnished commandos includes a variety of types thus permitting flexibility in dress and battle equipment.

Normal clothing is "battle dress," a two piece woolen garment, stout shoes and anklets (short leggins). In colder weather a sleeveless buttonup leather jacket which reaches the hips is worn over or under battle dress. A two piece denim dungaree is also provided for wear over battle dress in damp or rainy weather. In addition to the ordinary hob-nailed shoes, a rubber soled shoe and a rope soled shoe are provided for missions that require stealthy movements over paved roads, through village streets, for cliff climbing, and so forth. A heavy ribbed wool cardigan with long sleeves and turtle neck and a wool undervest are also available for cold weather wear. No overcoats are worn at any time during training or operations even in severe weather. All clothing is designed and worn with the sole purpose in view of comfort and utility under actual operating conditions. No leather belts are worn either by officers or enlisted men. A fabric waist belt is provided for wear when deemed appropriate.

Basically, every officer and man is provided with standard army field equipment similar to our own. In addition, certain special equipment is available in Commando stores and is issued to individuals or troops as the occasion requires. Principal items are listed below:

Fighting knife; Tommy (individual) cooker; Lensatic compass; Field ration; skiis and poles; Individual waist life belt (Mae West); Primus stoves; one gallon Thermal food containers; gas cape; wristlets; 2 man rubber boat; plywood (sectionalized) canoe; collapsible canvas canoe; bamboo and canvas stretchers; 2" scaling ropes; 1" mesh heavy wire (6' x 24") in rolls for crossing entanglements (see under "Training"); Toggle ropes (see under "Training"); Transportation equipment (administrative) consisting of: 6-Hillman pick-ups (4 seats), 3-1500 lb. trucks, 1-3 ton truck, 10-motorcycles;

Communication equipment: 10 Radio sets (#18 portable voice and key type, weight 36 lbs, voice range 5 miles), Semaphore flags, Blinker guns, Very pistols and flares.

Training.

Commando training is conducted along the following lines:

It seeks the development of a high degree of stamina and endurance under any operating conditions and in all types of climate.

It seeks to perfect all individuals in every basic military requirement as well as in special work likely to be encountered in operations, viz: wall climbing, skiing and so forth.

It aims to develop a high percentage of men with particular qualifications, viz: motorcyclists, truck drivers, small boat operators, locomotive engineers, etc.

It aims to develop self confidence, initiative and ingenuity in the individual and in the group.

It seeks to develop perfect team work in operating and combat.

An officer or enlisted man volunteering for commando duty is personally interviewed by an officer.

In its training the S.S. Brigade is prepared to accept casualties rather than to suffer 50% or higher battle casualties because of inexperienced personnel. All training is conducted with the utmost realism and to the end that the offensive spirit is highly developed. Wide latitude is accorded commanders in the training methods employed, and thus the development of initiative, enterprise, and ingenuity in the solution of battle problems, and the development of new techniques is encouraged. A corresponding latitude is accorded troop commanders. Only the highest standards are acceptable and if officers and men are unable to attain them, they are returned to their units immediately. Leaves are accorded commando personnel during prolonged training periods and after actual operations in order to prevent men "going stale."

An appreciation of the type of training conducted by commandos may be arrived at by brief descriptions of observed routine training executed by five different commandos over a period of five days.

Assault Course.

All obstacle assault courses are not the same but vary in accordance with terrain.

Cliff Climbing.

Commandos receive special training in cliff climbing and troops are sent from time to time to appropriate regions for practice.

Demolitions.

A general course is given to all members of commando troops in demolitions and more detailed instructions are given to a demolition group within each troop. These specially trained groups are taught demolition as affecting bridges, rail installations, machinery, oil tanks, etc. They are taught how to crater and to blow buildings to provide temporary road blocks. At Troun on December 3, during the course of a a night problem (attack on a village), in which three troops participated, the following demolitions were employed: Bangalore torpedoes for gapping wire, booby traps installed in likely avenues of approach, and well camouflaged and piano trip wires set to explode land mines. The Bangalore torpedoes were real enough but booby traps and land mines were represented by detonators. Very few booby traps were exploded as men kept their wits about them and their eyes open. Sufficient training allowance of all types of high explosives, fuzes, and detonators is made available so that this important training is continuous. A plastic type of HE is used extensively. Neither TNT nor Nitro-starch is employed.

Street Fighting.

House to house street fighting is extensively practiced.

Field Combat Firings.

Both day and night field firings were observed. In one night firing exercise, a troop fired on low silhouette targets at a range of about 150 yards. The terrain was rolling countryside. A light rain was falling. Illumination was provided by Very lights fired from the flank. It was attempted to keep the flares 50 yards in front of the targets. Bren gunners posted on the flanks of each subsection fired with the subsection. Approximately 50% hits were scored out of an average 170 rounds fired per section.

Much time is devoted to tactical problems ("schemes") in which live ammunition is fired by all weapons. The strikingly effective use of smoke in assault at night was shown.

Marches.

On December 5, 1941, one troop of commandos executed a forced march of seven miles in one hour. Equipment: combat packs and rifles, uniform: battledress and steel helmets. This march took place along a macadam road through rolling countryside. The weather was chilly.

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Obstacles:

On December 3, and December 5, different troops were observed crossing barbed wire obstacles. Training and overcoming obstacles include:

1. Action against triple concertina.

2. Action against double-apron fence.

(In attacking any type of wire fastened securely to screw pickets, the pickets themselves on each side of the bay of wire to be crossed are seized by the leading men and bent to the ground, thus materially aiding in the wire-crossing.)

3. Use of Bangalore Torpedoes

Wall-Scaling.

1. Walls 10 - 12 feet high.

2. Walls 20 feet high.

Stream Crossings.

Stealth and initiative in field operations.

Troop operational methods of infiltration.

Discipline and Morale.

To all appearances the discipline and morale of commandos is exceptionally high. This may be in large measure accounted for by the fact that all commando personnel are selected volunteers who applied for this type of duty because of the prospects of frequent action.

In talks with officers and sergeants major we gained the impression that the discipline is largely self imposed and that the application of disciplinary measures by commanders is a rare necessity.

An excellent spirit of fellowship prevails between officers and enlisted men and is evident in all training and exercises. Officers participate in athletics with the men and two half days a week are set aside for rugger, soccer, cross-country runs, boxing and so forth. All are required to take part in one form or another.

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Officers and enlisted men are normally billeted in various houses throughout the town in which the unit is stationed and an extra living allowance is authorized. Contrary to the expectations of most officers this system has improved morale. It is probable too that the extremely low rate of venereal admissions is due to this form of billeting.

Undoubtedly the fact that commanders have the prerogative of immediately returning a man to his unit for breaches of discipline or inaptitude for commando duties has an important effect in maintaining the existing high disciplinary level.

The varied and realistic nature of the training undertaken is likewise an aid to morale. Current events talks are given weekly by all troop commanders using material furnished by ABCA (Army Bureau of Current Affairs). Outside speakers, (Naval officers, civilians, professors and so on) give weekly talks on the larger aspects of the war, its economics, etc. These all broaden the soldiers' point of view and dispel boredom.

Frequent week ends are granted from Friday P.M. to Monday A.M., and liberal leave policy obtains. The men are not allowed to go stale in training.

(Special Naval Observer, Serial 00013, A16-3)

  [redacted]

MECHANIZED VEHICLES

SAND CHANNELS FOR ARMORED CARS

It has been recommended that sand channels be carried on Humber armored cars, stowed across the nose of the vehicle. From the point of view of loading it is considered that no worse place could have been chosen. The front axle already has the entire weight of the spare wheel imposed upon it, and the additional weight of the sand channels forward of the front axle will aggravate matters still further.

This question of sand channels has been investigated and a new and much lighter design is under consideration by the Director of Tank Design. Modifications for moving the spare wheel from the front to the offside of all armored cars are also being incorporated in all vehicles. It is considered that this will greatly relieve the front spring which, in any case, is being strengthened.

GERMAN HALF-TRACKS USED AS TRACTORS

The Germans make considerable use of half-tracked vehicles as tractors. In many cases they are more nearly three-quarter tracked. It is suggested it would be advantageous for us to develop a fully tracked tractor utilizing the American rubber track and the Cletrac transmission with suitable reduction gear. It is realized that the rubber track would probably be useless elsewhere than in the desert. Such vehicles should be capable of pulling recovery trailers to most places which can be reached by a tank, and it is considered they would be of great value in the forward areas. The vehicle should be fitted with a winch. It is not suggested that vehicles of this type would replace normal wheeled tractors and trailers for use in rear areas.

A Churchill tank chassis is under development in the United Kingdom for similar use as a recovery vehicle.

(M/A Report, London, No. 47672.)

GERMANS EXPERIMENT WITH AMPHIBIOUS CARRIERS

Reports have been received that the Germans are experimenting with an amphibious troop carrier. The particulars given are inconclusive but indicate that the vehicle is somewhat similar to the American "Roebling Alligator" Amphibious Troop Carrier. Following are details of this carrier:

Length	24' 0"
Width	10' 0"
Height	12' 0"
Speed (roads)	20 m.p.h.
Engine	Not visible, but believed to be gas rather than Diesel.
Track: Type	Flat plates: Plates appeared thin and light in weight.
Width of Track	10"
Estimated Capacity	36 fully equipped troops.

Two propeller shafts extend through the rear of the body hull. Each shaft is about 30 inches from the sidewall of the vehicle. Each propeller consists of two blades, each about 20 inches long. A rudder, about 24 inches high and 18 inches wide, is attached to the rear of each propeller shaft housing.

The sides of the upper part of the hull extend out over the tracks. The lower forward section of the hull curves upward at an angle of approximately 45 degrees. The entire forward section of the hull presents a blunt appearance.

The upper edge of the hull is encircled by a 1½ or 2 inch rope. The bottom of the hull is a flat surface except for the forward end. Ground clearance is estimated to be 26 inches. When first observed, this vehicle was making a 180 degree change in direction, pivoting on the road on one track.

(Issue No. 43, G.S.I., G.H.Q., Middle East, Technical Intelligence Summary.)

 PART IX [redacted]

MEDICAL

JAUNDICE AMONG U. S. TROOPS

Twelve hundred additional cases of hepatitis (jaundice) have been reported in Northern Ireland. The majority of cases are hospitalized. The disease is caused from yellow fever vaccine; a study of the epidemic is being made. (Note: There have been reports of jaundice among troops in several other areas.)

(M/A Cable, London.)

PART X

ORDNANCE

BRITISH:

The pull-through thong has been substituted by the British for the cleaning rod used for the Thompson submachine gun.

(M/A Cable, London.)

UNITED STATES: (HAWAII)

It is essential that modifications of barrel reams to the chambers of calibre 50 machine gun barrels be accomplished before departure, or that notification to contrary be given.

The arrival in Hawaii of transient planes without roll tool armorers is seriously depleting local stocks of items which roll tool armorers carry.

(Fort Shafter, J-24)

GERMANY:

It is reported that the Germans have manufactured a new long range flame thrower utilizing a powder containing aluminum.

(Fort Shafter, J-24.)

QUARTERMASTER

GERMAN NIGHT DRIVING EQUIPMENT

The special night-driving equipment which is fitted to German vehicles was designed by the Nova-Technik G.M.B.H. of Munich in collaboration with the Army Mechanization Experimental Department, Wuensdorf, before the outbreak of war. The equipment consists of the following parts:-

(a) The black-out headlamp mounted on the left-hand side of the vehicle between 32" and 48" from the ground.
(b) The special interval-judging rear light and stop light, carried on the left-hand side of the vehicle.
(c) The additional rear light, fitted with a dimming device, and carried on the left-hand side of the vehicle.
(d) The additional rear light, fitted with a dimming device, carried on the right-hand side of the vehicle.
(e) A three-stage dimmer switch is installed.

The Head-Lamp is of a peculiar flattened shape, and makes use of a horizontal 35-watt lamp emitting light rearwards against a semi-oval mirror. This mirror in turn reflects the light back through a glass diffusion-panel under the over-hanging hood. A soft, almost flat-topped beam of light results. The beam is projected for a length of 30-40 meters and a width of about 25 meters and is particularly diffused towards the edges.

It is claimed that the beam from the head-lamp is invisible when on "low," from heights exceeding 500 meters, when on "medium" above 800 meters, and when on "full" above 1500 meters. The same distances also apply to ground observation, horizontally.

It should be noted that the vehicle's normal sidelights are also kept on in order to mark clearly the breadth of the vehicle, but they are masked very thoroughly so that their light is not visible beyond 500 meters.

The headlamp of the leading vehicle is switched down to the lowest possible switch position compatible with the darkness of the night and the danger of observation. The rule is that thc darker the night, the less is the light to be used.

In convoys only the leading vehicle will normally use its blackout headlamp, and all the remaining vehicles will switch to the H position

(see above), using the Interval-judging panel to keep station.

It is possible that drivers are trained to follow a convoy with the switch in H position and without sidelights, in which case each fifth vehicle would have its headlamp switched on.

It is emphasized that care is to be taken when negotiating gradients at night, as ground observers may obtain a glimpse of the light source when the vehicle is climbing a hill or just descending into a valley. The headlamp should be switched off when it begins to illuminate the crest of a rise.

(Issue No. 43, G.S.I., G.H.Q., Middle East, Technical Intelligence Summary.)

PROTECTIVE CLOTHING FOR GERMAN ARMORED CAR CREWS

A German Army Council Instruction of May 7, 1941, authorizes the issue of protective clothing or overalls to the crews of armored cars. The suits are to consist of trousers and jacket, made of rushgreen drill, similar in pattern to the black field Service dress.

The suit will be worn either as a camouflage over the black Field Service dress, or as a summer uniform without the black tunic or trousers.

(Issue No. 43, G.S.I., G.H.Q., Middle East, Technical Intelligence Summary.)

SIGNAL CORPS

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JAP TYPE P3A RADIO DESCRIBED

Following is a description of the Japanese Type P3A radio set:

The transmitter has a single valve oscillator/amplifier using type valve UY 510 B. The power supply is obtained from a hand driven generator giving 500 volts high voltage and 7.5 volts low voltage. The approximate valve dissipation is 25 watts.

The wave range follows:

400 -- 580 Kcs.)
580 -- 1000 Kcs.)
1000 -- 2000 Kcs.) Each range has a set of plug-in coils.
2000 -- 3000 Kcs.)
3000 -- 5700 Kcs.)

The set is crystal controlled. Three crystals come with the set -- 2960, 3283, 5550 Kcs.

Rod aerials are not used. A simple type aerial with metal mast sections is employed.

A built-in key is used, with an extension key breaking the negative lead. The general performance is good, and the components and finish are excellent.

The receiver has a 5-valve superhet - high frequency Mixer, Intermediate frequency detector and pentholde low frequency, with regenerator on the high frequency stage.

The power supply is derived from dry batteries both for high voltage and low voltage. The high voltage is 90 tapped at 67.5, and the low voltage 3.

Following is the wave range:

350 -- 625 Kcs.)
625 -- 1100 Kcs.)
1100 -- 1950 Kcs.) Each range with a set of plug-in coils.
1950 -- 3450 Kcs.)
3450 -- 6000 Kcs.)

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Two pair headphones are supplied with the set. The operation is simple and the performance good.

(M/A Report, London, No. 48097)

DESCRIPTION OF RADIO NEEDED IN ICELAND

Recommendations have been made as to the need for numerous radios of the following type: battery operated, voice range of 50 miles, operational simplicity (desire transceiver type), 4 bands crystal controlled, 1500-440 kilocycles frequency range, powered by twelve or six volt batteries, verticle type antennae preferred like BC 69 J. (Hallicrafter at - 12 - A modified), SCR 543 type is recommended. SCR 281 with BC 69 A, if modified, is desirable for use with battery. Motor generators (Jannette) of six and twelve volts have previously been furnished with SCR 281. The BC 69 A Antenna is suggested. Operation by gasoline is considered undesirable owing to the need of positive quick starting action for antiaircraft intelligence system. The SCR 281 or SCR 543 with BC 69 A unit and two battery sets furnished per radio is recommended, with one gasoline powered charging set furnished for each radio. Each set should have spare parts kit, and crystals for set. The frequency is to be determined and ordered later.

(J-147, Iceland)

SUBMARINE DETECTION

It is believed that radio sets direction finding SCR 206 A or equivalent can be used to locate submarines which surface at night to transmit information gathered during the day. Submarines cannot be picked up by Rader detectors. A skilled operator is needed for each set.

(J-29, Ft. Shafter)

UNCLASSIFIED

PART XIII [redacted]

TANKS

OPERATION OF U. S. TANKS IN LIBYA

In recent operations in Libya, British bombings of friendly tanks from the air, and anti-tank action against friendly tanks were evident during the entire battle. The need for clearer identification marks on our tanks has been suggested.

The United States medium tank in this battle gave an excellent performance, according to the British. Some British observers said medium tanks had been hit as high as twelve times by 50 mm and even 88 mm shells and were still in operation. It is also reported that as far as is known the front of the American medium tanks have not been penetrated.

(M/A Cairo, J-11)

TANK REQUIREMENTS IN LIBYAN FIGHTING

Crews of the American made medium tanks, now designated as "General Grants" are asking for as much 75 mm ammunition as it is possible to carry. Seeking a total operational capacity of from 80 to 90 rounds, they are prepared to forego 37 mm and Browning ammunition and also to remove the front hull guns and mounting.

A plan has been worked out by the Middle East Engineers which will permit the following ammunition load:

75 mm	81 rounds
37 mm	80 rounds
.303 mm	5000 rounds
.450 mm	700 rounds

Military Engineering has been cabled for stowage diagrams and details of the scheme referred to.

The British are considering the development of command tanks. These would be standard tanks suitably modified to carry two radio sets, the armament being replaced by dummy equipment. Vehicles of this nature are being considered for use as observation posts, for Royal Horse Artillery (completely motorized) and field artillery units in Armoured Divisions.

(G-2 COMMENT: The Germans have command tanks. The British feel the need of them, not only as command tanks but also as O.Ps for artillery supporting tank units.

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The basic principle for artillery O.Ps is that the O.P. should be in the same type of vehicle used by the supported unit. Therefore an armored car is more suitable for artillery supporting an Infantry Division. The American Scout Car has been used with success.)

No decision has yet been taken on the requirements for command tanks. A description of the "British Crusader" tank modifications is promised in the next technical report and drawings are being sent separately by air mail. It is stated that the "General Grant" has not yet been investigated in this regard.

Removal of the auxiliary turret on the "Crusader" tank has been approved and this is being accomplished. The opening in the hull is being blanked off and the space used for stowage.

The frequency of failure of the 8,500 pound springs in the suspension of the American medium tank (General Grant) is becoming very high. Various theories have been put forth to account for this, but none is entirely satisfactory. The main reason appears to be that the springs are not suited to the demands made upon them.

Three cases of failure of the big end bearing of the master connecting rod have occurred. No explanation can be found for the fractures. It is interesting to note, however, that a case of sudden fall in oil pressure occurred in an engine while on the test bed. Investigation showed an air lock in the oil suction line and it was necessary to prime the line before the pump would deliver any oil. Users should be warned that the system must be most carefully checked for leaks and that the failure to get oil pressure on starting is probably due to an air lock in the suction line.

A weakness in design which has been brought out as a result of the investigation into fires is the considerable area which present designs of fuel tanks offer to hostile fire. In future designs consideration should be given to keeping fuel tanks as low and unexposed as possible.

(G-2 COMMENT: The proper protection of ammunition should also be considered.)

The P.8 compasses have proved to be quite indispensable to tanks, but they are not yet sufficiently accurate to allow them to be used as a sole method of navigation. Apart from leakage of fluid and breakages of the glass of the grid ring, no defects have occurred in the same compass equipment. It is suggested that the supply of a metal cover to fit

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over the compass would save damage. P.8 compasses are now being issued with a brass cover which meets the point raised.

The engine oil tank on Crusaders is in two parts, interconnected by a small pipe. It has been reported by units that it takes a driver up to one hour to fill it with oil, and that the flow between the tanks is so slow that an impatient man is apt to assume that both tanks are full when only the one into which the filler passes is really full. A modification is being introduced by which an additional connecting pipe 2" diameter will be run between the tops of the tanks.

(G-2 COMMENT: The oil system is also a source of much difficulty.)

During the recent fighting there were two cases of British Valentine tank drivers being killed and collapsing over the gear lever. The remainder of the crew were unable to remove the driver to get at the gear lever on the clutch and were unable to stop the vehicle. A similar incident occurred in a British Matilda tank during General Wavell's advance, although in this case it should have been possible to disengage the clutches with the hand wheels provided. It is considered that all Armoured Force vehicles should be fitted with a means for stopping the engine from the fighting chamber.

A "dead man's switch" is fitted to most gasoline driven tanks. The question of providing the British Covenanter and the American tanks with this switch is being considered.

(M/A Report, London, No. 47672.)

BRITISH EXPERIMENT IN TANK RADIO CONTROL

The British have adapted a system of radio control to operate on a tank. The project is successful but still entirely experimental.

The British have applied radio control to aircraft ("Queen Bee"). The Admiralty has also placed it on motor launches. Now it has been extended to the tank, experimentally. A U. S. observer accompanied by a British Junior Officer, saw and operated a Matilda tank equipped with radio control.

The tank had been stripped of its turret for ease of accessibility, and various devices had been added to operate the vehicle with push buttons. There were two engine speeds available. The gears were selected automatically according to speed of the vehicle and position of the

throttle, (similar to Oldsmobile hydromatic selection). Braking and turning were operated by compressed air on pistons. The tank would reverse and turn while reversing.

The radio control consisted of two standard Number 19 sets, and was operated by impulses in two separate tones. The set in the tank controlled the push buttons and hence the tank. The control was mounted on a truck, though it could have been on another tank if desired. On the top of the control radio was a control box with three levers and a switch. The positions of these levers regulated the behavior of the tank. The switch set off a smoke candle on the tank.

While there are a few changes to be made in the apparatus, it functioned very well. Its range is claimed to be three miles, though it is advantageous to the controller to observe its actions to avoid obstacles. It could, of course, be controlled from an airplane.

Only the experimental model has been produced. So far it is a "toy" but as soon as it is perfected it will be presented to the War Office for decision as to whether or not it will be used, and what uses it will be put to. It has been suggested as a decoy, smoke or mine layer, mine field clearer (coupled with use of "Snake" or other device, demolition bomb (similar to the Beetle) etc.

(M/A Report, London, No. 48034.)

[redacted]

SECTION II

A TACTICAL STUDY
OF
THE EFFECTIVENESS OF THE GERMAN 88 MM ANTI-AIRCRAFT GUN AS AN ANTI-TANK WEAPON IN THE LIBYAN BATTLE

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A Tactical Study

Of

The Effectiveness of the German 88 MM Anti-Aircraft Gun As An Anti-Tank Weapon in the Libyan Battle

Recent cables from American military observers in Cairo and at the front with the Eighth British Army in Libya stress the important role being played by the German 88 MM anti-aircraft gun in the ground phase of the desert battles now in progress.

The effectiveness of this weapon as a tank destroyer was rather clearly apparent in the course of the November and December British Libyan offensive. One of our observers at that time stated in an official report that the 88 MM was the most feared weapon which the British tanks had to face, and that the destruction wrought by it, on both chassis and turret of the British tanks, was incomparably greater than that caused by any other Axis weapon.

The characteristics of this gun are as follows:

Muzzle velocity	2750 feet per second
Weight of shell	19.8 pounds
Vertical range	37,000 feet
Horizontal range	16,000 yards
Weight in firing position	5.2 tons

The gun is tractor drawn.
It is provided with a steel shield of unknown thickness.

An American military observer who had many opportunities to witness this gun in Germany in 1940, speaks of this weapon as follows:

> "The 88 MM is basically a gun for firing on moving targets. The crew is also specially trained for firing on highly rapid moving targets, primarily on airplanes. The whole control apparatus is designed for fast moving targets with a very rapid rate of fire: 25 rounds per minute. The gun is capable of great volume fire and extreme accuracy against moving targets of any type. It is equally efficient on targets on the ground as well as in the air. For attacks on armored vehicles, it is provided with a special armor-piercing shell."

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The German 88 MM anti-aircraft gun was designed and constructed in secret in the ten year period prior to the advent of Hitler, when the German army was subject to rigid personnel and material limitations. It is known that it was the plan of its designers to construct a dual purpose anti-aircraft and anti-tank weapon. The anti-tank purpose of the weapon was, however, veiled in secrecy and the German intentions in this regard did not become known to the world until the Polish campaign of 1939.

However, so definitely was the Axis attitude offensive, not only in Poland but in the French campaign of 1940, as well, that United Nations observers did not grasp at the time the full significance and effectiveness of this weapon.

Commencing in 1940, the Germans began to provide these guns with an armored shield in order to protect its personnel against small arms bullets as well as smaller anti-tank projectiles.

It appears that this weapon has played an important role throughout the Russian campaign. However, far more exact information is available as to its use in Libya, than on the Russian battlefields.

In November 1941, when Gen. Auchinleck launched his major offensive, Marshal Rommel, his opponent, created three tank proof localities along his front line: at Bardia, Sollum and in the vicinity of Halfia pass. The defenses of each of these strong points were built around a battalion (12) of 88 MM AA guns, so sighted as to provide all round protection. These guns were supported by a large number of smaller anti-tank weapons. So well organized were these strong points that they were never seriously attacked, and only fell when the British had pushed on to Benghazi and when the water and food stocks of the strong points became exhausted. The British ascribe the long resistance put up by these strong points to the difficulty they found in coping with these dual purpose weapons.

In the battle now raging in Libya, Rommel's offensive use of these weapons is of considerable interest. The anti-aircraft guns appear to follow closely his armored vehicles. As soon as the front begins to stabilize, the 88 MM AA guns go into position and around them is then organized a "tank proof" locality. The German tanks are then withdrawn for offensive operations elsewhere.

The effectiveness of these weapons is clearly brought out from the following quotations from reports of observers now at the front in the desert battle around Tobruk:

One report includes the following statement:

> "The German 88 MM guns penetrate the armour of all British tanks. British tanks dare not attack them. Up to now the British seem incapable of dealing with these weapons."

Another observer reports as follows:

> "At a point in the Knightsbridge area, the 4th British armored brigade faced some 35 German tanks of the Mark III and IV type drawn up in line and obviously inviting attack. These tanks were supported by a battalion of anti-aircraft guns (12). The commander of the 4th Brigade refused to attack at all because of the presence of these guns on the battlefield.
>
> "Slight firing occurred throughout the day. Towards evening the superior British tank force withdrew and the German tanks attacked after nightfall in a new direction. Their 88 MM guns had checked the British all day and permitted Rommel to seize the initiative as soon as the British threat had vanished."

Still a third report reads as follows:

> "The greatest single tank destroyer is the German 88 MM anti-aircraft gun. For example, on May 27th at 8:00 A. M., Axis forces having enveloped Bir Hacheim, a German tank force of sixty tanks attacked the British 22nd Brigade some distance to the northeast. The British moved to attack this force with 50 light and medium American tanks. It soon became apparent that this British force was inadequate and the Brigadier commanding ordered a second regiment of 50 tanks into action. In ten minutes the 88 MM German AA guns destroyed 8 American medium tanks of this reinforcing regiment. All day thereafter, the British engaged the enemy half-heartedly and finally withdrew. Sixteen American medium tanks were lost in all. These sixteen fell victims without a single exception to the 88 MM AA gun."

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Col. Pashley

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TACTICAL AND TECHNICAL TRENDS

No. 5

August 13, 1942

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All correspondence pertaining to the bulletin should be addressed to the Evaluation and Dissemination Branch, M. I. S.

SECTION I

TACTICAL AND TECHNICAL TRENDS

AIR (TECHNICAL)

1. THE NEW MITSUBISHI-NAGOYA ZERO FIGHTER

Early in July, a wrecked Japanese plane was found on Akutan Island. Examination revealed it to be a heavier, more powerful edition of the Mitsubishi Zero Fighter. Known as the Mitsubishi-Nagoya Zero, this plane has a longer and thinner tapered wing than its shorter and stubbier predecessor. Like the earlier Zero fighter, it is a low-wing monoplane with retractable landing gears and is powered by a twin-row 14-cylinder radial, air-cooled engine. Its normal range of about 500 miles can be increased by the use of detachable belly tanks to 850 or 1150 miles, depending on the size of the tanks. Its supposed maximum ceiling is 33,000 feet. Heavier and faster than the previous Zero Fighter, its reported maximum speed is 344 miles per hour.

There follows a detailed report of the Mitsubishi-Nagoya Zero:

Low-wing, all-metal, single-seat monoplane, single engine, pronounced dihedral, flush riveting used throughout, well streamlined, shows excellent construction. The plane is Zero type, No. 1, Carrier fighter plane, Model 2, put into service February 19, 1942.

Fuselage. About 23 feet long.

Wings. Pronounced dihedral, 40-foot wingspread, swept back on leading edge, tapered on trailing edge, about 24 inches of wing tips which fold up for stowage, split wing flaps, round wing tips; wings riveted solidly to fuselage. Wings 8 feet, 3 inches wide where they join fuselage. Place provided for bomb rack on each wing. When wing tips are horizontal, but not locked, a red tab projects to warn pilot. Much improvement is shown over our planes in the manner in which the lights on wings and tail are faired into the wing and tail.

Tail. Horizontal tail fin has slight negative dihedral, and is placed above center of the fuselage. It is tapered on both edges, but mostly on the leading edge; about 6 feet 8 inches long from fuselage to tip and 4 feet 9 inches wide next to the fuselage. The vertical fin is tapered about 45 degrees on leading edge.

Motor. Made by Nakajima, 14-cylinder, double-row, air-cooled radial. Motor is fastened with four bolts. Quick-change power plant assembly.

Propeller. 3-bladed, constant speed, spinner over propeller hub. Made by Sumitomo Metal Works Corporation, Propeller Manufacturing Plant.

Landing gear. Retractable, hydraulic system; when wheels are retracted, recess is covered with flaps; tire size, 600 x 175; tail wheel and arresting gear are retractable; tail wheel is solid rubber about 6 inches in diameter.

Armament. Two 20-mm. guns, one in each wing, about 60 rounds of ammunition for each; air-cooled; derived operating power by means of the Oerlikon method based on the "blow back" principle. The Japanese guns have a 30-inch barrel, pneumatic cocking device, pneumatic trigger motor, sturdy three-point suspension, a flash hider constructed as part of the barrel. Estimated muzzle velocity is 1,800 feet per second. Ammunition is stored in a sixty-round

container. Ammunition was similar to our 20-mm. although the cartridge case was considerably shorter, and the type of fuse different. Several types of ammunition were known to be used. Although the guns examined were exposed to severe climatic conditions for almost five weeks, no signs of corrosion were evident. The guns gave every indication of precise workmanship and extremely careful maintenance.

Two 7.7-mm. recoil-operated guns, are synchronized to fire through the propeller; 500 rounds per gun; guns are type 97 made by Nippon Manufacturing Corporation; fixed machine gun, type 3, revision 2, 1942. Three sizes and shapes of 7.7 ammunition are loaded in the following manner: 1 tracer, 1 armor-piercing, 1 incendiary, 1 armor-piercing, 1 tracer. The tracer is semi-boat-tailed. Others have square bases, but are not the same size or shape. Cartridges are about 1/4 inch shorter than .3006, and wider at base. They are not rimless. The primer is much larger than normal, and is made with two firing points inside. The jacket is cupro-nickel. The cartridge will chamber in M 1, but will not fire because of rim and wide base. One bullet examined had flaw where jacket was incomplete.

Equipped with electric gun sight; No. 150; shows 16, month 12 (December, 1941). Manufactured Sendaida Optical Works Corporation.

Gas Tanks. Detachable plywood belly tank, streamlined, about 18 inches in diameter, and 6 feet long. It is divided into compartments with splash boards, and sets nearly flush against the plane. It is fastened with one casting just aft of its landing gear. Apparently the belly tank holds only about one half of its rated capacity of 150 gallons.

There is a gas tank of welded and riveted aluminum in each wing, believed not to be leakproof.

Armor. No armor on any part of the plane.

Cockpit. Single seat, with pilot strapped to seat in three places; no armor; cockpit cover resembles plexiglass. Automatic flight control. Plate inside cockpit has following information: Place of manufacture--Mitsubishi Heavy Industries Co., Nagoya Airplane Manufacturing Plant. Name, Zero type Model, type A6M2 engine; Nakajima NK 1; weight, 1,715.0 kilograms (3,782 lbs.); carrying capacity, 650.3 kilograms (1,434 lbs.); entire weight, 2,365.3 kilograms (5,216 lbs.); the year, date, and month of completion, was February 19, 1942.

Radio. Two way radio; radio mast aft of cockpit is of streamlined wood, hollow with copper wire inside. 96 Type air, Number 1, wireless voice transmitter, type 1. Receiver No. 976, January 1942. Manufactured by Toyo Electric Corporation.

The radio compass was made by Fairchild Aero Camera Co., New York City. Aerial #429. Loop located in pilot enclosure just in back of pilot's seat. Controls located on right hand side of cockpit. L or R meter located on

instrument dash board. This equipment looked as though it had been used before it was installed in this plane. Frequency range, 170 to 460 and 450 to 1200 KC. Switch was located in the 450 to 1200 KC position when gear was removed.

The radio receiver has 5 Japanese-made tubes of the following types: one 6C6 RF amplifier, one 6A7 1st detector and oscillator, one 6C6 IF amplifier, one 76 second detector, one 76 audio stage. Receiver is super-heterodyne with a crystal-controlled oscillator to determine the frequency of the receiver. It has a beat oscillator for CW reception. One dial to tune antenna and 1st detector stage. Frequency can only be changed by changing the crystal which plugs in the front of the panel. Both transmitter and receiver were using 4145 KC crystals. No other crystals were located in or about the plane. Radio was made by Toyo Electric Corporation in January 1942. Dynamotor is marked generator, air Model 1, revision 1, input 12.5 volts, 13 amps; output for sending 500 volts, 0.12 amps; output for receiving 150 volts, 0.03 amps. No. 302360; weight, 6.8 kilograms (15 lbs.) Made February 1942 by Koana Manufacturing Corporation.

The radio transmitter has power of about 10 watts, crystal controlled, voice of C.W. Frequency range approximately 2,000 KC to 6,000 KC. Frequency can only be changed by removing crystal and inserting another. Has a neon bulb for indicating resonance in the plate circuit and an antenna ammeter with maximum reading of .8 of an ampere. Power supply is in the 12 volt plane battery and a dynamotor supply of about 600 volts, D.C. Transmitter uses one Japanese 503 tube for oscillator and one Japanese 503 tube for modulator. These tubes seem to be the equivalent of an 807 RCA tube.

There were 3 dynamotors on the plane, one each for transmitter, receiver, and radio compass. They were located aft of the cockpit. The generator taken from the Fairchild Radio Compass was an Eclipse made in the United States.

Engine Oil Tank. Weight, 7.400 kilograms (16.3 lbs.); capacity, 60.0 liters (15.7 gals.).

Aileron. 130 inches long; 16 1/2 inches wide next to the fuselage, 8 inches wide at outside end. All control surfaces are of fabric.

Bomb Load. Place provided for a bomb rack on each wing.

Arresting Gear. Retractable; hook on arresting gear can be released by pilot.

Insignia. Insignia on top and bottom of wings; insignia on both sides of fuselage are much brighter than those on the wings; yellow stripe around after part of fuselage.

Parachute. Type 97 (1937) Parachute, Model 2; number of manufacture, 1490853; manufactured, September 9, 1939, at Fujikura Heavy Industries Corporation.

Remarks. All parts are marked with name plates. The plane is light gray in color. All the inside metal surfaces are finished with blue coating. The electric gun sight was repaired with friction tape. This was the only part that showed wear.

2. FRENCH SE-200

French reports indicate increased production of aircraft for the French Naval Air Fleet.

Factories of the Societe Nationale des Constructions Aeronautique du Sud Est at Marignane, near Marseille, have begun a second series of 70-ton SE-200 flying boat. These heavy, six-engine boats are reported capable of transporting 40 passengers and 5,100 gallons of gas and oil, or 20 passengers and 7,500 gallons of gas and oil. Cruising speed is 186 miles per hour, with a range of 3,728 miles non-stop.

The plans for this flying boat were developed for the same design competition as the Potez-SCAN 161, six-engined flying boat that is now undergoing its tests.

3. ORGANIZATION OF GERMAN ANTIAIRCRAFT UNITS

The basic tactical antiaircraft unit in the German antiaircraft artillery is the battalion. In accordance with standard German organizational practice, antiaircraft artillery defense forces are organized as task forces. Battalions of various categories of antiaircraft armament are assigned to a particular commander for the execution of a particular mission. The size and composition of an antiaircraft artillery task force depends on:

a. The assigned mission (and its importance).
b. The amount and characteristics of enemy aviation.
c. The amount, types, and characteristics of friendly aviation available.
d. The commander's estimate of the means required.
e. The amount and types of antiaircraft artillery materiel available.
f. The terrain.
g. Proximity to the enemy.
h. Weather and season of year.

There are believed to be several different types of regimental organization in the German antiaircraft artillery. Several that have been mentioned by usually reliable sources are heavy-gun regiments, medium-caliber regiments and searchlight regiments. These units are used in large defenses such as the ones about Berlin. Another regiment is the composite type made up of battalions of the various arms for the execution of missions smaller in scope.

Judging from observation of the way in which the German High Command conducts their campaigns, as soon as the German Air Force has control of the air, then a part of the antiaircraft artillery becomes available for other purposes, principally antitank. Its characteristics make it ideally suited for antitank defense. The use of antiaircraft artillery armament against British and French tanks on the Western Front in 1940 played an important part in frustrating the operations of Allied armored units against the German offensive.

During the campaigns in Poland and on the Western Front, the 37-mm. gun was the principal German antitank weapon. In Russia, the 50-mm. weapon is replacing the 37-mm. antitank gun and the 37-mm. gun in the Mark III tank, as rapidly as materiel becomes available. Even the 50-mm. gun is not sufficiently effective against the largest Russian tanks, therefore a more powerful weapon is needed. Large caliber antiaircraft guns are used for this purpose. When the air is relatively free of enemy aircraft, the 88-mm. guns form the backbone of the antitank defense. For this reason, the German practice of assigning an antiaircraft corps to a Panzer army serves a useful purpose in giving great defensive fire power to a strong offensive force.

From German reports, antiaircraft guns have also been used in assaults upon fortifications, to interdict important communications within effective range, and for direct support of infantry units. It must be remembered, however, that these secondary uses are only permissable when there is little or no threat from the air.

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Light and medium antiaircraft automatic cannon (20-mm. and 37-mm.) have been used very effectively against Russian machine-gun nests, especially at dawn and dusk when there was sufficient visibility for daylight operations, and yet enough darkness to observe the muzzle flashes.

The primary mission of antiaircraft searchlights is to illuminate hostile planes so they may be fired upon. Even if the planes cannot be illuminated, the searchlights make it difficult for the enemy air crews to orient themselves. Searchlights are also used to deceive hostile aviation personnel as to the exact location of important objectives.

The organization of the searchlight battalion is not definitely known. The presence of 27 lights in the 150-cm. battalion suggests three batteries, each composed of three platoons of three lights each. The 60-cm. searchlights are used with light and medium caliber weapons. It is believed that each light and medium-antiaircraft artillery battalion is normally equipped with 12 of these lights, organized into one battery, composed of four platoons of three lights each.

In the German armed forces, the light and heavy machine guns are identical, excepting that the light machine gun is used on a bipod mount (direct fire only), while the heavy machine gun is used on a tripod mount (direct and indirect fire). Naturally, there is no difference when the gun is used on antiaircraft mount.

In the employment of antiaircraft guns, it appears that special consideration is given to the defense of the artillery. This is true for defense against both air and armored attacks. As a result, heavy antiaircraft gun batteries are sometimes emplaced forward of the artillery positions.

In obtaining information of enemy air operations, the Germans use the same system as we do. They have an aircraft warning service, a territorial warning service, as well as an antiaircraft artillery information service manned and operated by the antiaircraft forces themselves. The aircraft warning service is a separate unit manned by its own operating personnel. It extends all over Germany, and over the occupied areas wherever there is danger of enemy aerial attacks. It is of special interest to note that the Germans have mobile aircraft-warning service stations organized into companies which can be placed about vulnerable areas and objectives in accordance with the situation.

The sketch following is an analysis of the altitudes (or slant ranges) of responsibility for defense against enemy aerial attacks.

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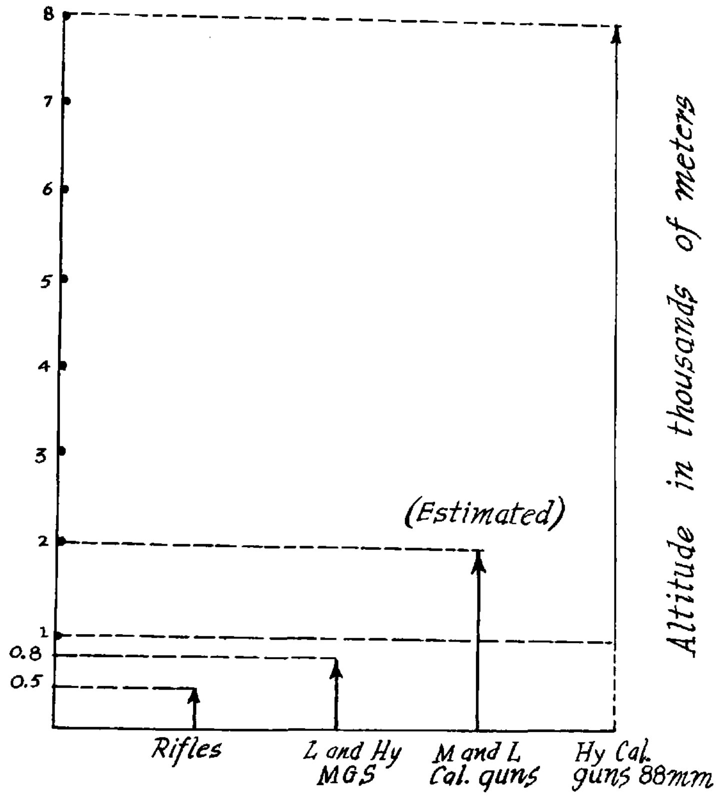

4. GERMAN TROOP TRAIN PROTECTION AGAINST AIR ATTACK

The movement of troops by rail is always attended by dangers incident to sudden air attacks. The extent to which these can be successfully warded off, may often determine the final outcome of a battle.

The German Air Force Manual includes a section entitled "Protection of Troop Trains Against Air Attack."

Where trains are to be protected by means of antiaircraft machine guns, the troops transported will furnish 3 antiaircraft sections. Three antiaircraft railroad cars are provided, one at the center of the train, and one at the center of the front and rear halves of the train. There are two types of railroad cars: an open high-sided car with a superstructure or scaffolding, and an open low-sided car. The type of car used depends upon the make-up of the train. Thus in the case of non-motorized units which will use roofed cars for the most part, the guns must be placed at a considerable height in order to get a clear field of fire. Therefore, two high-sided cars with a superstructure are used, and only one low-sided car. This allotment of cars is reversed for motorized units. The high-sided antiaircraft cars are spotted in the train with the roofed cars, the low-sided antiaircraft cars with the open cars. Where possible, the guns are mounted on vehicles when the low-sided car is used.

In conjunction with the antiaircraft machine guns, 20-mm. antiaircraft guns may be used. When the 20-mm. guns are to be used, 2 antiaircraft sections are formed, and 3 low-sided cars, specially designed for antiaircraft use, are provided. One car is placed at the tail-end of the train and another at the center. The third car is placed immediately behind the locomotive so that when the direction of the train is changed, as in switching for example, the tail car need not be shifted; if possible, this car should also be provided with a gun. At least 2 open cars with low loads should be coupled to either side of these special antiaircraft cars in order to give a good field of fire. Additional 20-mm. guns may be used when required.

Care must be taken that the guns are not struck by obstructions, such as passing trains, tunnels, signal posts, etc. For this purpose, lookouts are detailed to observe on each side of the train. When not firing, the 20-mm. guns should be pointed directly to the front or rear depending on their sector of fire.

No warning of attacks can be expected, so all antiaircraft personnel must be kept in a constant state of readiness. There are two aircraft watchers, one observing an arc of 180° to the front, the other to the rear. These watchers should be selected from among the best-trained men and relieved frequently.

The procedure for firing is as follows: The normal zone of fire of the guns near the front of the train is to the front, that of the guns near the rear, to the rear; these guns will support each other only when there are no planes within their respective normal zones. The guns in the middle of the train support the front or rear guns as the situation may require. When the train is moving, only tracer ammunition will be used since the motion does not permit accurate sighting. Care must be taken not to shoot up signal posts and other installations, and even if under attack no firing may be done where there are overhead power-lines. At prolonged halts, when for one reason or another fields of fire are obstructed, the guns should be dismantled and set up at suitable points in the surrounding countryside.

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5. GERMAN BALANCED ANTITANK PROTECTION

The German 88-mm. dual-purpose AA and AT gun has been a vital factor in Rommel's African campaigns. However, this gun is only one element in the excellent antitank organization of the Germans and should be viewed in its proper perspective.

In accordance with German Army principles, each combat unit, from the smallest to the largest, is so organized, armed, and equipped as to be tactically self-sufficient. Antitank protection is vital to the successful accomplishment of a combat mission; therefore, suitable antitank weapons are provided for each unit. These weapons are used in accordance with the German doctrine of antitank defense, which may be summarized as follows:

Staffs, troops, and supply echelons must be prepared for a tank attack at all times. Careful ground and air reconnaissance and map study assist in indicating the avenues of approach feasible for hostile tank attacks. Certain terrain features are natural obstacles to tanks and must be used to full advantage. The favorable avenues of approach must be protected by antitank guns, artillery, mines, and tanks.

The antitank units, organically a part of infantry regiments, battalions, or companies contribute their fire power to the support and protection of their respective organizations. Those antitank units which are organically a part of corps and divisions, constitute a reserve force which, because of their mobility, can be rushed to decisive areas as determined by the general situation.

Early information relative to hostile tanks permits timely and coordinated defensive measures. All reconnaissance agencies must be required to report immediately tank information to the commander and to the troops specifically threatened.

Certain situations may require the attachment of additional units to antitank battalions such as signal, engineer, and infantry troops.

Antitank protection has been provided for in each of the units, from the smallest to the largest; furthermore, the amount of protection is being steadily increased.

Each infantry company is protected by a section of 3 AT rifles. In Africa, each company of a light division was reported to be equipped with two 76.2-mm. captured Russian field guns for antitank use. (However, see this publication, No. 3, p.5.). Each infantry battalion is protected by 9 AT rifles.

Each regiment is protected by 27 AT rifles and by an AT company which has 3 platoons, each armed with four 37-mm. AT guns (total 12), and one platoon of four 20-mm. rapid fire AA-AT guns.

A trend toward substitution of the 50-mm. AT gun for the 37-mm. AT gun is progressing rapidly.

The infantry division is protected by 81 AT rifles, forty-eight 20-mm.AA-AT guns, and seventy-five 37-mm. or 50-mm. AT guns. The divisional AT battalion has 3 companies of twelve 37-mm. AT guns each and one company of twelve 20-mm. AA-AT guns. One AA battalion of twenty-four 20-mm. AA-AT guns and nine 37-mm. AA guns, or of thirty-six 20-mm. AA-AT guns may be attached.

The motorized division is protected by fifty-four AT rifles, twelve 20-mm. AA-AT guns, fifty-four 37-mm. AT guns, and nine 50-mm. AT guns. The motorized AT battalion has 3 companies of eight 37-mm. and three 50-mm. AT guns and one company of twelve 37-mm. AA-AT guns. An AA battalion of twenty-four 20-mm. AA-AT guns and nine 37-mm. AA guns may be attached.

The armored division is protected by high velocity guns mounted in the tanks (totaling one hundred seventeen 37-mm. or 50-mm. high velocity guns), by an AT battalion with twelve 37-mm. and eighteen 50-mm. AT guns, or an AT battalion with twenty-four 47-mm. self-propelled AT guns each mounted on a Mark I tank chassis with a three-sided armor shield, and by an AA Battalion with thirty-three 20-mm. guns.

A mobile AA battalion from the air force is often attached to a division when additional protection is required. This battalion contains 3 heavy batteries of 88-mm. AA guns, each battery consisting of four 88-mm. AA guns and two 20-mm. AA guns; 2 light batteries, each consisting of fifteen 20-mm. AA-AT guns and four 60-cm. searchlights; 1 searchlight battery consisting of nine 150-cm. searchlights and 6 sound locators.

Generally speaking, antitank weapons are of two types: either single-purpose, such as the 50-mm. AT gun, or dual-purpose, such as the highly effective 88-mm. AT and AA gun. The characteristics of the most commonly employed AT weapons may be summarized as follows:

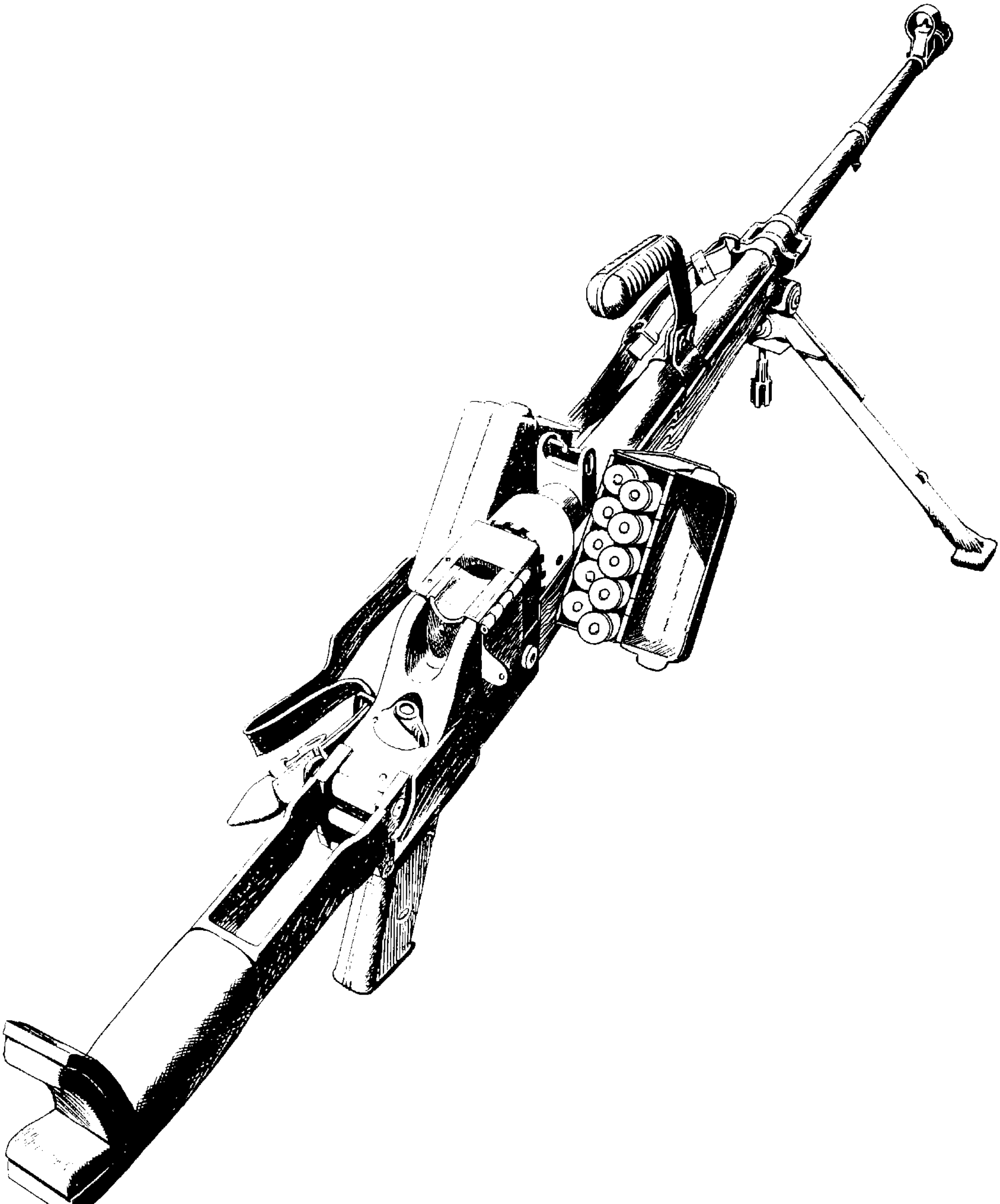
I. SINGLE-PURPOSE ANTITANK WEAPONS

7.92-mm. AT Rifle (See sketch)

Specifications:

Weight	27 1/4 lbs.
Length (shoulder rest extended)	62 1/4 in.
Length (shoulder rest folded)	50 3/8 in.
Rate of Fire	6-8 r.p.m.
Muzzle velocity	3,540 f.s.
Penetration (Homo hard armor-plate at 100 yds., 90°)	33 mm. (1.3 in.)

Remarks: This AT rifle has a hand-lever-operated dropping block and is a single loader. Its ammunition is a special high-velocity armor-piercing type with a super-heavy charge contained in a 13.2-mm. case necked down to take a 7.92-mm. tungsten-carbide cored bullet.



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GERMAN 7.92-MM. ANTITANK RIFLE

37-mm. AT Gun

Specifications:

Maximum range	4,400 yds.
Penetration (steel plate at 90°)	43 mm. (1.7 in.) at 330 yds. 33 mm. (1.3 in.) at 650 yds.
Rate of fire	12 r.p.m.
Traverse (trails closed)	4°
Traverse (trails open)	58°
Weight of AP shell	1.68 lbs.
Weight of HE shell	1.37 lbs.

Remarks: This is one of the main antitank weapons. The gun has two shields, fitted one above the other. The upper shield moves with the gun in traverse. There are four types of shell: armor-piercing with and without tracer, and high explosive with and without tracer. The gun is mounted on a well-sprung carriage and is fitted with low-pressure pneumatic tires for transportation as a motor trailer. It can be drawn by a detachment of soldiers across country for short distances.

47-mm. AT Gun

Specifications:

Weight (approximate)	1,980 lbs.
Length of barrel	7 ft. 2 in.
Muzzle velocity	3,000 f.s.
Weight of projectile	3.75 lbs.

Remarks: This gun made its appearance in the German Army in 1940. It is of Skoda manufacture. The mounting is a modified Mark I tank chassis.

50-mm. AT Gun (See sketch)

Specifications:

Weight	1,760 lbs.
Length of varrel	9 ft. 10.5 in.
Muzzle velocity	2,953-3,280 f.s.
Rate of fire	16 r.p.m.
Weight of AP shell	4 lbs. 9 oz.
Weight of HE shell	3 lbs. 15 oz.

Remarks: This antitank gun was issued to the main units of the German Army in the spring of 1941. It is steadily replacing the 37-mm. as the standard antitank gun. The carriage is provided with an armor-plated shield and has a tubular split trail. The AP shell has pierced the armor of British infantry tanks and cruiser tanks and our light and medium tanks. There are also reports of a

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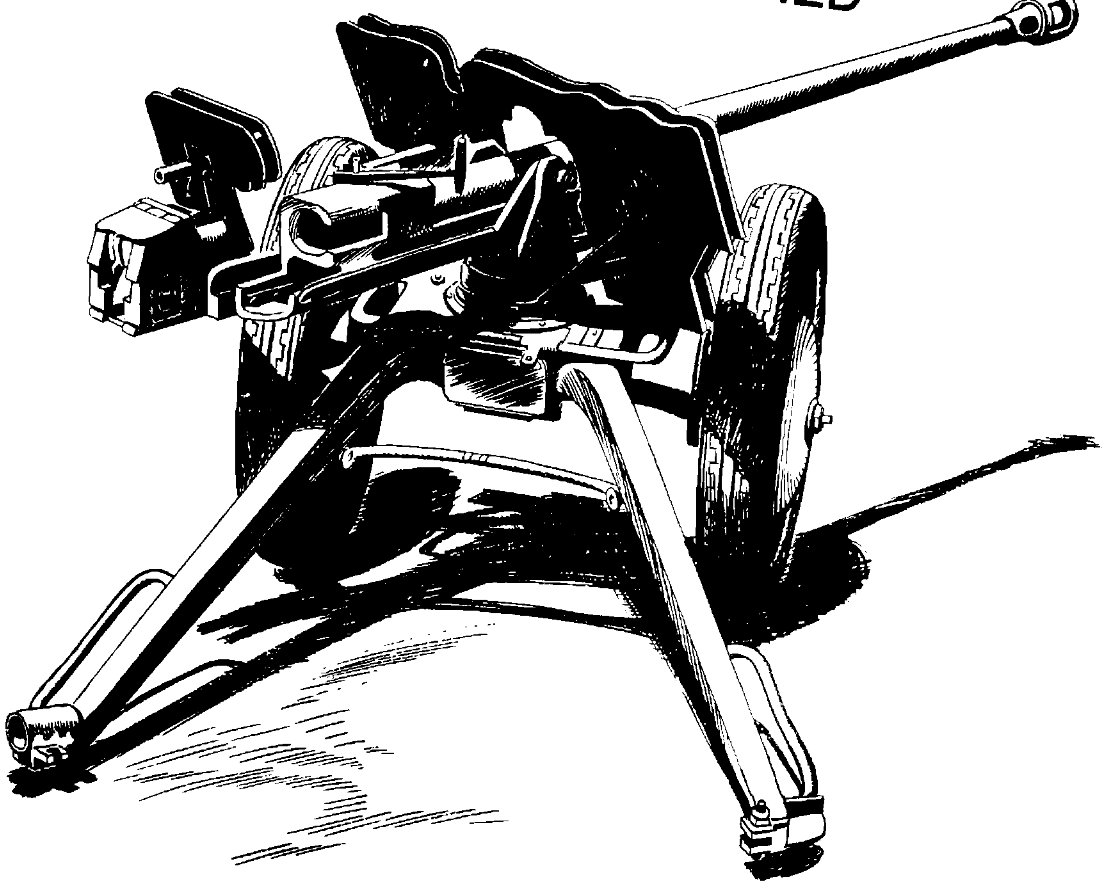
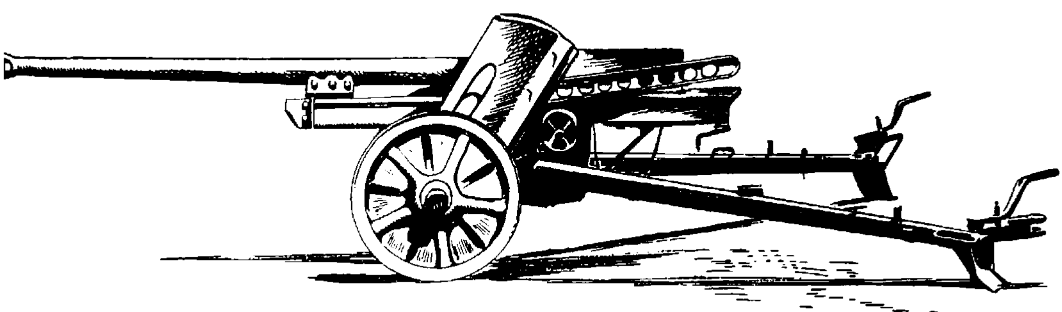


GERMAN ANTITANK GUN (M 41)



GERMAN 50-MM. ANTITANK GUN

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50-mm. AT gun on a self-propelled mount.

50-mm. Tank Gun (High Velocity)

Specifications:

Weight	421 1/2 lbs.
Length overall	210 cm. (12 ft. 11 in.)
Length of chamber	30.5 cm. (12 in.)
Length of rifling	162.2 cm. (5 ft. 4 in.)
Muzzle velocity	3,444 f.s.
Weight of AP shell	3.9 lbs.
Rifling	
Poly-groove plane section	
Uniform twist of 1 in 35 calibers	
16 lands, 3.5 mm. wide	
Grooves, 6 mm. wide, .75 mm. deep	

Remarks: This gun is mounted in the new Mark III German tank and has been very effective.

AT Gun (M 41) (See sketch)

Specifications:

Weight	501 lbs.
Muzzle velocity	4,700 f.s.
Caliber at breech	28 mm.
Caliber at muzzle	20 mm.

Remarks: The barrel of this semiautomatic gun is constructed on the Guerlich principle, i.e., it tapers from 28 mm. at the breech to 20 mm. at the muzzle as above indicated. The gun uses the so-called arrowhead type of ammunition. The life of the barrel is thought to be not over 400 rounds. The gun has a welded carriage with a split trail. It is served by a 5-man crew. It is manufactured by the Austrian firm of Böhler.

II. DUAL-PURPOSE WEAPONS

20-mm. AA-AT Gun

Specifications:

Weight in action	1,012 lbs.
Muzzle velocity	2,950 f.s.
Maximum horizontal range	6,124 yds.
Maximum vertical range	12, 468 ft.

Rate of fire - theoretical	280 r.p.m.
Rate of fire - practical	Unknown
Elevation	0° to $+90^{\circ}$
Traverse	360°
Length of bore	65 cals. (4 ft. 3 in.)
Weight of shell	0.308 lbs.

Remarks: This gun may be towed by a light tractor or be self-propelled, mounted with a shield on a half-track vehicle. It fires self-destroying tracer ammunition. There is also a four-barreled type called the "Flakvierling." (See this publication No. 4, p.3.)

37-mm. AA Gun

Specifications:

Weight in action	3,400 lbs.
Muzzle velocity	2,800 f.s.
Maximum horizontal range	8,744 yds.
Maximum vertical range	15,600 ft.
Rate of fire - theoretical	150 r.p.m.
Elevation	-10° to $+85^{\circ}$
Traverse	360°
Length of bore	50 cals. (6 ft.)
Weight of shell	1.4 lbs.

Remarks: This gun is motor-drawn or self-propelled on a half-track vehicle. It fires self-destroying tracer ammunition.

47-mm. AA Gun

Specifications:

Weight in action	3,400 lbs.
Muzzle velocity	2,620 f.s.
Maximum horizontal range	11,695 yds.
Maximum vertical range	24,000 ft.
Rate of fire - theoretical	25 r.p.m.
Rate of fire - practical	15 r.p.m.
Elevation	-10° to $+85^{\circ}$
Traverse	360°
Weight of shell	3.3 lbs.

Remarks: This gun originated in Czechoslovakia. It is tractor-drawn, but may also be self-propelled.

88-mm. AA Gun (See sketch)

Specifications:

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Weight in action	10,400 lbs.
Length of bore	65 cals. (18 ft. 9 in.)
Muzzle velocity	2,750 f.s.
Maximum horizontal range	16,000 yds.
Maximum vertical range	37,000 ft.
Rate of fire - theoretical	25 r.p.m.
Rate of fire - practical	15 r.p.m.
Elevation	-3° to $+85^{\circ}$
Traverse	360°
Weight of shell	19.8 lbs.

Remarks: A tactical study of the gun has been previously made in this publication; see No 1, p. 29.

It is a high velocity dual-purpose gun equipped with a shield and has been used most effectively in the African campaigns. Its effectiveness is due to (1) mobility - towed on trailer by half track with ammunition in rear and can go into position very quickly by use of outriggers and demountable spade; (2) flexibility - (when not firing from trailer), can change from AT to AA fire in 5 to 6 seconds, traverse 360° and has specially trained crews who are able to take full advantage of its capacity to fire on rapidly moving targets; (3) high velocity - has penetrated all types of British tanks and also our own light and medium tanks.

*　　*　　*　　*　　*　　*

In conclusion, the German Army has developed a system of balanced antitank protection which complements its system of antiaircraft protection. All units from the company to the division have an all-around "cubic space" (three-dimensional) protection against the greatest threats of modern warfare, the tank and the airplane.

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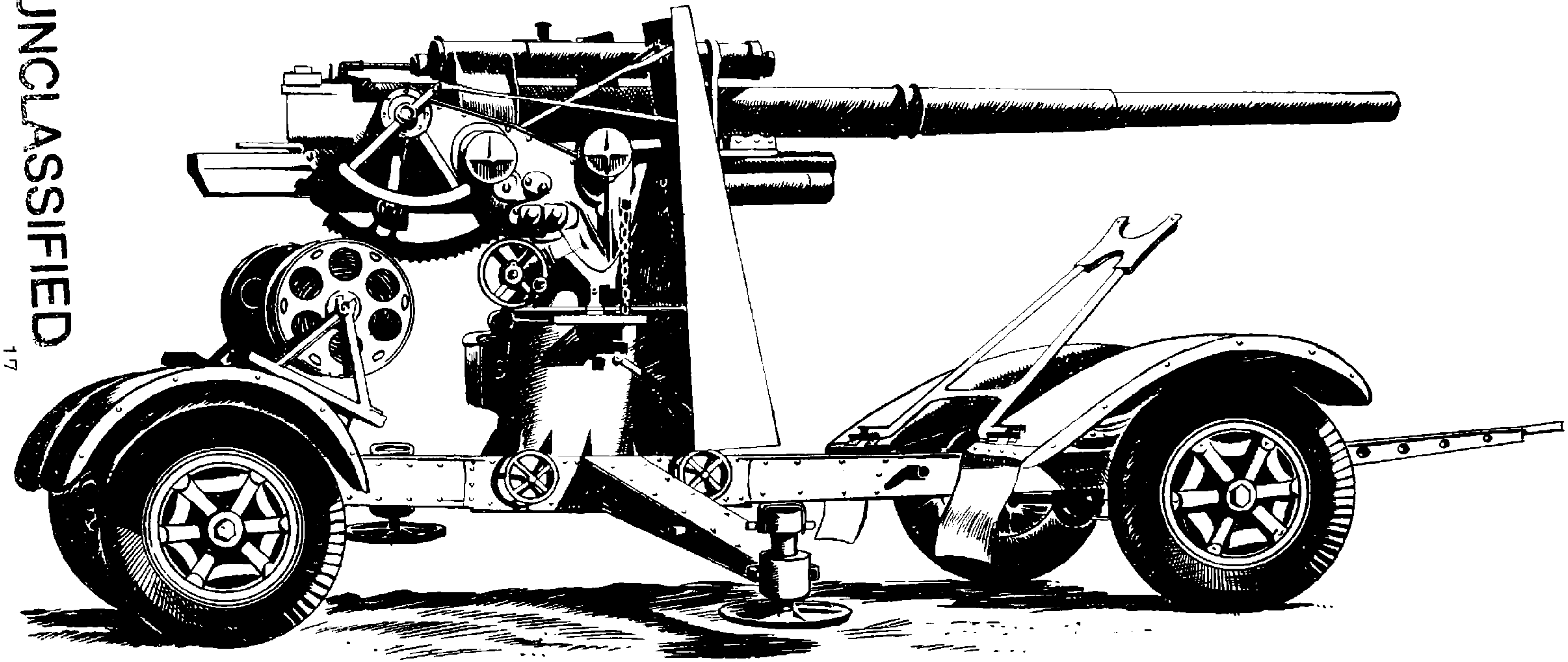

GERMAN 88-MM. ANTIAIRCRAFT-ANTITANK GUN

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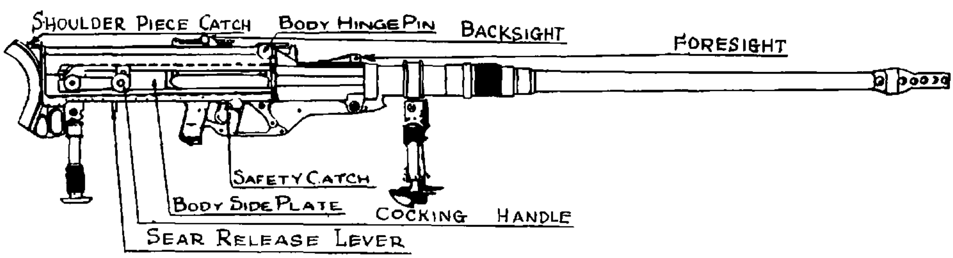
6. ITALIAN 20-MM. ANTITANK RIFLE (SOLOTHURN)

This antitank rifle is a self-loading, single-shot weapon. The rifle can be set at "safe" or "fire" by means of a thumb-operated catch on the pistol grip. (See accompanying sketch.) It is fired from the shoulder off the bipod. Some of its specifications are as follows:

Caliber	20 mm. (.79 in.)
Weight with empty magazine	120 1/2 lbs.
Overall length	7 ft. 1 in. (including recoil reducer)
Rate of fire	10—20 aimed r.p.m.
Sights (a)	Blade foresight, leaf backsight, leaf backsight graduated to 1,500 meters
(b)	Telescopic sight mounted on bracket
System of operation	Recoil. Breech positively locked on firing by rotation of locking lugs
Feed	Magazine capable of holding 10 rounds, but normally loaded with 8 rounds only
Weight of H.E. and A.P. shell	4 ozs.
Muzzle velocity	2,750 f.s.
Penetration (armor plate at 500 meters, 90°)	30 mm.

Remarks: This gun is carried by two men and is sometimes found on tanks, armored cars and motorcycles. It is effective only in keeping mechanized patrols at a distance.



ITALIAN 20-MM. ANTITANK RIFLE (SOLOTHURN)

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7. GERMAN EYEGLASSES FOR USE WITH GAS MASK

The wearing of eyeglasses with a gas mask always presents a problem. The Germans, however, have devised a very simple and satisfactory solution. The lenses, conforming to the individual's particular optical prescription, are set in approximately circular rims joined by the usual bridge. In place of the usual hinged side members, there are double three-bar sliders through which are fastened the two ends of a loop of tape, 0.3 inches wide. The tape fits over the ear and is secured after adjustment by a hook at the end of each slider. Even though the tape may become twisted, a gas-tight fit of the facepiece can be obtained. The glasses and extra tapes are carried in a metal case.

8. TREATMENT FOR BLISTER GAS

Several small bakelite boxes taken from German prisoners in Libya were labelled "HAUTENTGIFTUNGSMITTEL" and contained ten small tablets. Upon analysis the tablets were found to be stabilised bleach, with an available chlorine content of 39.8 percent. These were identical with tablets found on German prisoners in Europe. They are referred to in German as "Losantin." Each box had ten tablets, and the normal issue is reported to be two boxes per man. The method of use for treating skin contaminated by blister gas, is printed on the label, and consists of making a tablet into a paste with water or saliva which is then applied to the affected part. After ten minutes it is washed or wiped off. The example of the incautious experimenter who ate several tablets under the impression that he was eating "Nazi food tablets" should NOT be followed.

It has been reliably reported that tablets of bleaching powder are distributed to workmen in all large German factories for skin application against the effect of mustard gas and lewisite. (See Tactical and Technical Trends, No. 1, p. 8.) A sample tablet was examined, with a label attached, bearing the inscription "CHLORKALKSTIFT D" (bleach pencil D).

This tablet was found to consist of bleaching powder which had undergone extensive decomposition through exposure. However, it would still provide slight beneficial effect on contaminated skin, though it is definitely inferior to the "losantin" tablets (see above) in bakelite containers issued by the Germans.

9. FRENCH LIGHT ANTITANK MINE

The enemy has several times been reported to be using French light antitank mines, and it is likely that a considerable stock of them were acquired after June 1940. It is believed that the French had various mines of the general design described below, differing therefrom only as to dimensions and weight. No definite information is available concerning the explosive filler and firing pressure of these mines.

There follows a description of one of these mines.

Length of base plate	32.4 cm. (12.75 in.)
With of base plate	22.2 cm. (8.75 in.)
Length of body	24.1 cm. (9.5 in.)
Width of body	14.0 cm. (5.5 in.)
Height of body	6.3 cm. (2.5 in.)
Material of body	pressed steel
Weight of filling	approx. 2.5 kg. (5.75 lbs.)
Weight of mine	6.5 kg. (14.5 lbs.)

The mine is rectangular in shape, and is provided with a base plate with holes at each corner for holding-down lugs. The lid (1) (see sketch) is corrugated, and is strengthened by two strips of metal (2) on the inside, and one strip (3) on the outside. The two inside strips carry a central hole over which are welded the pieces (4), which have indentations for the striker heads of the igniters. When the mine is in the "safe" condition, the channel-shaped aluminum safety bar (5) rests on the bodies of the igniters, and is prevented from falling out by a pin (6), and a ring (7). The lid (1) is held loosely by means of chains (8) attached at either end to the base of the mine. When the safety bar is removed, the lid descends until the striker heads (9) rest in the indentations in the pieces (4).

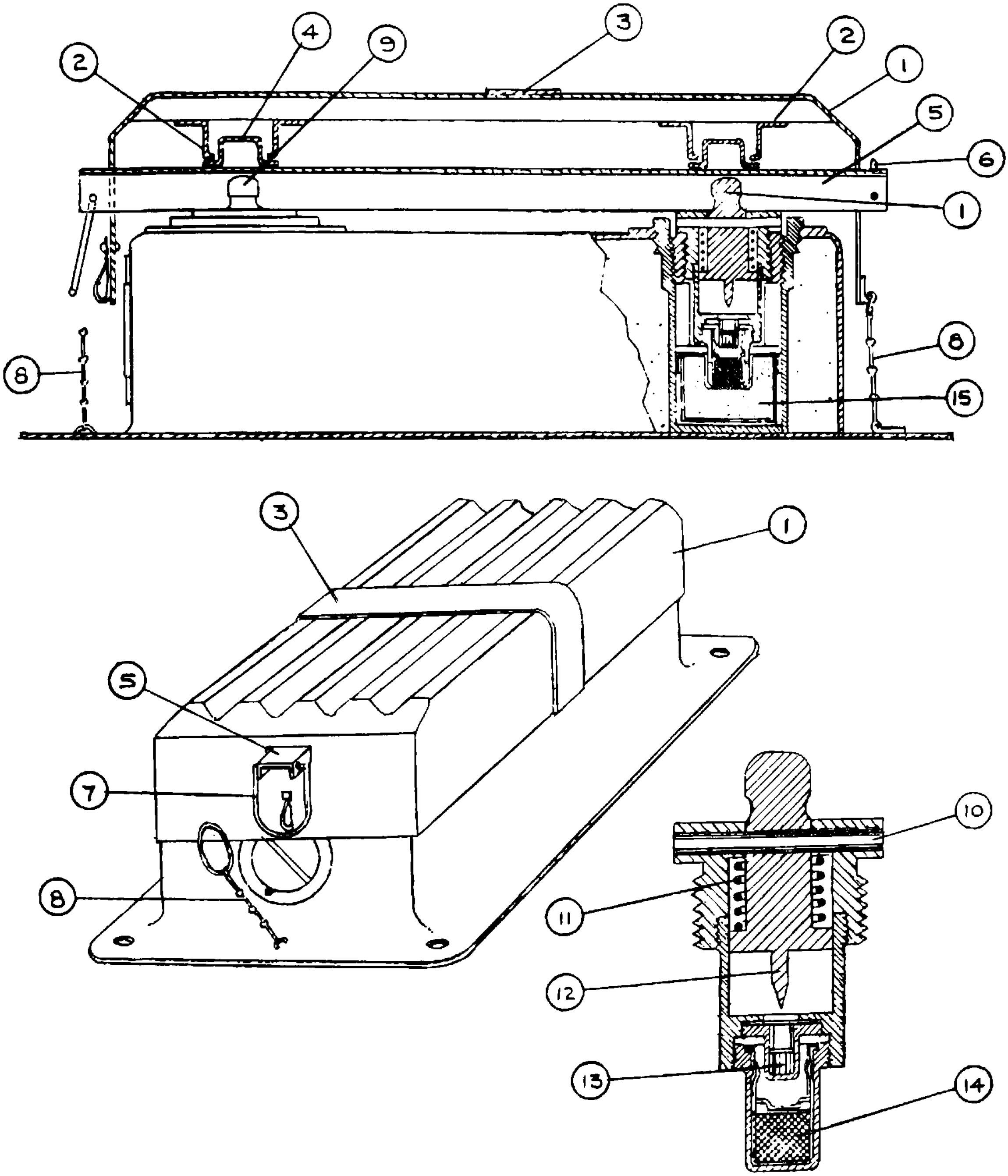
The igniter functions when pressure on the striker head (9) shears the pin (10). A strong steel spring (11) then forces the needle (12) on to the cap (13), and this in turn fires the detonator (14). Below the detonator is the exploder (15), which consists of a sealed metal box containing the exploder composition.

Method of functioning. The mine is actuated by pressure on the lid (1), which fires one or both of the igniters.

Method of handling. When armed, the safety bar (5) will be missing, and the lid will be resting on the igniters (9). No safety device is incorporated in the igniters. The method of disarming is as follows:

(1) Carefully detach the single chain at one end of the lid, and lift up the lid.

(2) Unscrew and remove the igniters, taking care not to exert pressure on the central striker head.



FRENCH LIGHT ANTITANK MINE

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(3) Replace the cover.

COMMENT: Soon after the start of the war, in the fall of 1939, the French decided this mine was unsatisfactory. It was unsatisfactory chiefly from the standpoint of procurement, since the rectangular shape is difficult to manufacture, and the use of two fuses is wasteful of critical materials and facilities. Accordingly, the French abandoned this mine and adopted a cylindrical type, with one fuse, similar to the German "Tellermine", and to our own.

10. SYMPATHETIC DETONATION OF GERMAN TELLERMINES

Tellermines, the most common type used by the Germans, may often be neutralized by sympathetic detonation, thus avoiding personnel casualties caused by antilifting devices, faulty firing mechanisms, or simple carelessness.

The results of tests made by exploding 3 or 4 pounds of guncotton near Tellermines buried 4 to 6 inches underground showed that the sympathetic detonation took place at about 30 percent greater distances when the guncotton was 4 feet above the ground than when it was exploded at ground level.

COMMENT: Guncotton is the standard British explosive. TNT would give the same results.

11. ITALIAN FLAME-THROWER

An Italian flame-thrower, fitted to a light tank, has been examined and found to have a maximum range of 100 feet. It is reported as mechanically inefficient, using an excessively large amount of fuel, which is towed in a trailer behind the tank. The fuel consists of a mixture of gasoline and fuel oil.

If a sufficiently powerful centrifugal pump, as well as additional fuel, were made available, it is believed that the flame could be thrown a distance of 300 feet.

12. EARPHONE BOOBY TRAP

In North Africa a single-earphone head set was used by the enemy as a booby trap. It exploded when the nickel-plated screw at the back of the earpiece was unscrewed. It may have been intended to explode when the current was appled, as in normal use. The charge was sufficient to blow the victim's hand almost completely off. It is believed to have been of Italian origin.

13. THE GERMAN LIGHT DIVISION

A recent report and a number of isolated pieces of information from various sources seem to provide a suitable opportunity for a short study of the German light division. (In issue No. 3 of Tactical and Technical Trends a report on the reorganization of the 90th German Light Division explained the several features and organization of this unit.)

This study must be regarded as tentative only, since detailed information is lacking and there is reason to believe that the light division has not yet emerged from the experimental stage.

First origins.

Light divisions were first reported in action in the summer of 1941 on the Russian front, when von Reichenau's Sixth and Seventeenth Armies constantly employed them in the spearhead of the attack; at times, they were the only spearhead divisions at the head of a thrust by one or the other of these two armies. There seems little doubt, in view of this employment, that the type was an experimental one, entrusted to the commanders mainly responsible for it.

It is thought that the four light divisions which at first emerged on the Russian front represented two separate types. Both were based on a two-regiment organization, but in one case the two infantry regiments were each reinforced by an artillery battalion, whereas in the other there was an independent artillery regiment.

The Libyan development.

It is believed that the 90th Light Division was originally intended to be based on the two-regiment organiztion. However, its development, both present and comtemplated, has been governed by the particular requirements of the operations in North Africa.

In the form now aimed at the 90th Light Division is to revert to a basis of three regiments. These are described as light infantry regiments, and consist of two battalions of four companies with a regimental headquarters company. In addition, there is an artillery regiment of two battalions only; a tank battalion is to be added; the other divisional units all depart to a greater or lesser extent from the organization met with in any other type of division.

The European development

No definite information is available as to any change in structure which the four original light divisions employed on the Russian front may have undergone. However during the period November 1941 to March 1942, three infantry divisions, which had suffered heavy casualties in Russia, and therefore had to be withdrawn from the front to reform, were transferred to eastern France and there reorganized as light divisions.

The first of these three divisions to complete conversion discarded one of its three infantry regiments, and the two other regiments were reorganized as "Jaeger" regiments, which may be compared with the crack rifle battalions of the old Imperial Army. The converted regiments each consisted of three battalions of 5 companies (3 rifle companies, 1 machine-gun company, 1 "heavy" company) and a regimental antitank company. The artillery regiment and all other divisional units were motorized, but the infantry regiments were not; it must be assumed that motor transport for them would be provided, when necessary, from the G.H.Q. pool.

The second of these divisions was given the same infantry structure of two "Jaeger" regiments, but its artillery and other divisional units remained on a horse basis. The third division also is believed not to have been motorized.

The progress of the experiment.

It appears, therefore, that the light division is still in the experimental stage. For European warfare, the two-regiment organization has been approved, but it seems probable that the reinforced regiment has been found less satisfactory than the "normal" infantry regiment with a separate artillery regiment. As regards motorization, however, it seems that a final decision has still to be taken.

The significance of the experiment.

The reason for the creation of the light division is apparently based on the principle of fluidity in the employment of special troops (an outstanding characteristic of the modern German Army), and on an increasing preference for the two-regiment division in the spearhead force.

The Panzer, motorized, mountain, and light divisions are all based on the same two-regiment structure. It follows that a spearhead force drawn exclusively from these types will be far simpler to control than one which contains a number of three-regiment infantry divisions. At the same time, tank regiments drawn from the G.H.Q. pool can more easily cooperate with regiments, the basic structure of which is the same as the infantry regiment of the Panzer division, and the motorized division, which regularly works in close cooperation with tank units.

The light division is apparently not fully motorized, because the special motor transport battalions of the G.H.Q. pool can transport the "Jaeger" regiments whenever necessary, and there is no need to tie up motor transport by a permanent allotment.

Conclusion.

It is concluded, therefore, that the light division is the new type which may in time supersede both motorized and "normal" infantry divisions. It is as

flexible and has as great striking power as the motorized division, but is less expensive to maintain. Just as the Germans effect great economy by reducing the divisional allotment of artillery by using the G.H.Q. pool to reinforce this division or that as the occasion requires, so likewise they would be able to economize in motor transport. They would also have a uniform structure in their attacking divisions, so that all are equally adapted for cooperating with tanks; and it may well be that the tank regiments, too may be largely transferred to the G.H.Q. pool with similar economy.

14. INFANTRY (TECHNICAL)

GERMAN PARACHUTES

Blueprints and plans of future campaigns could not be considered complete without the use of para-troops.

The types of chutes used by German troops of this branch consist at least of three kinds: marked R. Z. 1, R. Z. 16, and 36 D. S. 28. The R. Z. 1 appears to be the standard type.

The parachute equipment is divided into four main parts: the parachute proper (or canopy and rigging lines), the containing bag and pack, the harness, and the accessories.

The parachute itself consists of a silken canopy made up of a certain number of panels, each panel cut in the shape of a thin isosceles triangle with the apex removed. The R. Z. 1 and the 36 D. S. 28 (and probably the R. Z. 16) parachutes have 28 panels. Each panel has 4 gores (tapered sections), cut from a single piece of material in such a manner that warp and weft are both at an angle of 45° to the long axis of the panel. Panels are numbered serially in the lower corner, number 1 carrying in addition the special markings of the parachute. These are the manufacturer's stamp or trademark, which includes type, mark number, weight, date of manufacture, and identification number; the manufacturer's inspection mark, giving the date of the last factory inspection; and the Air Ministry stamp which gives the date of the Air Ministry inspection.

In a parachute with 28 panels there are 14 rigging lines which pass through the top vent, and are continued down through the seams on opposite sides of the canopy and then run as free lines to the lift webs. Each line is 21 meters (69 ft.) long, so that with such a canopy as the one described, 62 sq. meters (648 sq. ft.) in area, there is some 5 to 6 meters (16 to 20 ft.) of free rigging line on each side, between the periphery of the canopy and the lift webs.

When packed the canopy and rigging lines go insides the bag, which is fastened by means of a ring to the static line. The bag is then contained within the pack which consists of a base (next to the man's back) and 4 flaps which close over the bag.

A further bag, in which the whole parachute is kept during shipment, is included among the accessories, and is removed when the person enters the plane.

The harness is made of webbing and consists of a belt with large buckle in front, two braces, two thigh straps, and a strap across the top of the chest. It is connected to the rigging lines by hemp lift webs. Each web is so made that its lower end forms an eye which fits into the appropriate "D" ring of the harness where it is secured by a screw, the free upper ends being joined to form two eyes. To each of the four eyes so formed, seven rigging-line ends are attached.

The parachutes are automatically opened by a static cord, 6 meters (20 feet) long, fastened to the inside of the plane, which pulls the bag away from the pack, releasing the canopy, and then becomes detached, taking the bag with it. After a drop of some 80 feet the parachute has become completely operative and the subsequent falling speed of a man and parachute is about 16 feet per second.

15. MECHANIZED VEHICLES (TECHNICAL)

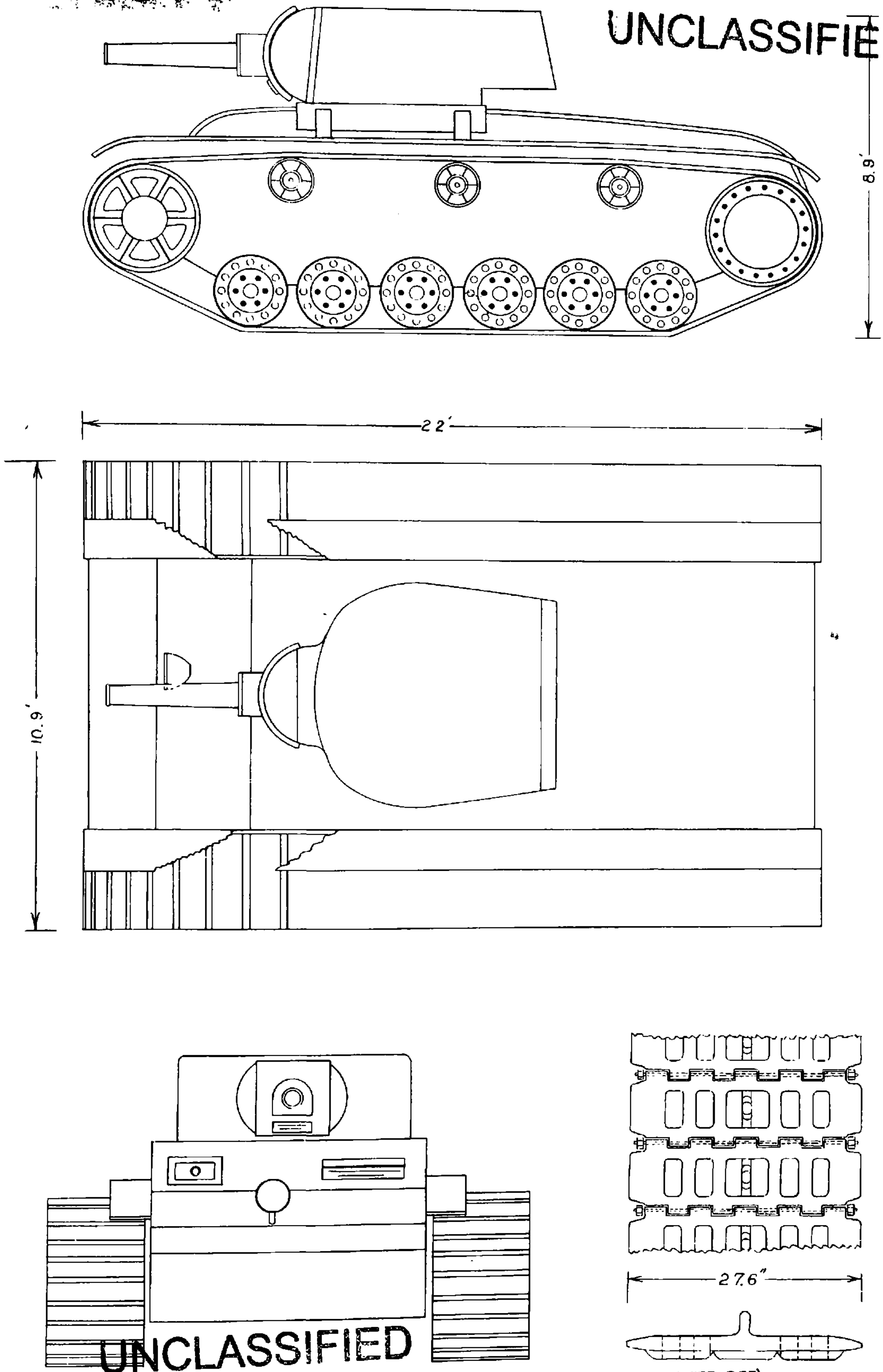
TANKS OF THE RED ARMY

The New Heavy Tank. Twelve months of war have brought substantial changes in the design of tanks of the Red Army. The new heavy tank has been named the Klementi Voroshilov, commonly referred to as the "KV", is 22 feet long, 10.9 feet wide, 8.9 feet high and weighs 51.2 tons. It has a road-clearance of 1 foot 4 inches, and can ford streams 5-5 1/2 feet deep. Its length permits it to span trenches 12-14 feet wide.

The "KV" is suspended on each side by six slotted wheels which give the outward appearance of double wheels. Each wheel is independently sprung on a rocker arm; the fin of the track is guided through the slot which prevents lateral distortion of the track. There are three return rollers and one idler wheel.

Improvements have been made in the track plate as well as in the method of interlinking them. There are no projections on the outside edges of the track plates on which snow or mud can become firmly lodged. The tread of the track has a grid pattern which insures a firm grip in snow and mud, and reduces side-slipping. Thus snow and mud cleats are not required.

A new method of joining the track plates has been devised. Each section or plate of the track has nine links which are interlocked by a full-floating pin. The pin itself is held in position by small disks or lock washers, these in turn held in place by a spring collar fitting in a recess between each of the nine links



NEW RUSSIAN HEAVY TANK (KLEMENTI VOROSHILOV)

of the plate (see sketch). A broken track pin is thus prevented from working out of the links and causing the track to separate and immobilize the tank.

The contoured turret, cast in one piece, weighs approximately 10 tons. The frontal armor of the turret is 3.54 inches thick, making it exceptionally rugged and capable of withstanding sustained enemy fire. It can be revolved 360 degrees either by power or by hand. Heavy steel bars laid on edge are welded at the base of the turret to deflect shells which might cause it to jam.

Following are the data on armament and armor of this tank:

(a) Turret armament: 76-mm. long-barrelled gun, (in some models of the KV a 152-mm. gun is installed in a specially designed turret).
One 7.62-mm. MG coaxially mounted with the gun.
One 7.62-mm. MG in rear of turret.

(b) Hull armament: One 7.62-mm. MG forward.
Two spare 7.62-mm. guns as replacements for the turret or hull guns; or one may be mounted on top of turret for antiaircraft fire, or even used on a tripod for dismounted action.

(c) Armor:

Front	90 mm.	(3.543 inches)
Sides	75 "	(2.952 ")
Top	40 "	(1.574 ")
Engine hatch	30 "	(1.181 ")
Turret sides	75 "	(2.952 ")
Rear end	40 "	(1.574 ")
Under sheathing	30 to 40 "	(1.181 to 1.574 inches)

Ninety rounds of AP and incendiary shells are carried for the cannon, the former being stacked behind the loader, the latter being distributed around the turret, under the floor boards, and in the driver's compartment. 3,000 rounds of machine gun ammunition in drums are carried in the turret.

The "KV" is propelled by a 600-horsepower 12-cylinder V-type diesel engine driving through a transmission and final drive to the sprockets at the rear of the tank. The motor is reported to be very noisy. The tank is equipped with both electric and compressed air starters.

It has five forward gears (four regular and one emergency), and one reverse gear. The tank carries 158.5 gallons of fuel inboard and can carry an additional supply in saddle tanks which can be discarded when empty, or prior to going into action. The normal range of action without saddle tanks is 110 to 125 miles across country. A maximum speed of about 21 miles per hour can be attained on an improved road.

The "KV" carries a crew of five consisting of the commander, driver, loader, gunner, and radioman. A mechanic sometimes makes a sixth member of the crew. The posts of the commander, loader, and gunner are in the turret. The driver and radioman ride side by side in a forward position.

The radio is in front on the left of the driver. The antenna is a vertical type mounted forward on the tank. Communication within the tank is by telephone. Inter-tank communication is visual, by either arm-signals or flags.

Tank warfare has taught the Russians lessons which have influenced their tank design. The turret is located well forward to permit tank infantrymen (desyanti, see Tactical and Technical Trends No. 3, page 44) to use it as a shield while riding atop the tank. Every provision has been made to prevent unwelcome riders from getting aboard. There is a lack of external fittings, tools, sharp projections, etc.; this meets the double purpose of eliminating hand grips for enemy hitch-hikers and the chance that a fire bomb or other missile could lodge on the tank. The fender of the tank is very narrow so that "tank hunters" who seek to jump aboard run the risk of being caught in the track. The newer American sponson-type tanks have no fenders as such and have solved these problems largely through basic design. As a further protective measure for the tank crew, the hatch in the top of the turret is so constructed that it cannot be opened from the outside. A special tool is required to open the hatch from the inside.

The Medium Tank - T-34. High maneuverability and relatively spacious interior arrangement have made this tank a favorite of Soviet tank crews. The Germans themselves have expressed the opinion that the T-34 was the most effective tank they have encountered.

The T-34 is a modified Christie-type tank. It has an overall length of 19 feet 1 inch and is 9 feet 8 inches in width. The low silhouette of the tank (8 feet 6 inches), beside maintaining 1 foot 3 inch road clearance, is an obvious advantage. The tank weighs 29.7 tons and has a maximum speed of 28-34 miles per hour on roads and 18.5 miles per hour across country. It can surmount the same cross-country obstacles as the "KV" except that its length limits the width of the trenches it can jump to about 11 feet. (See sketch.)

The turret is of the built-up, welded type, equipped with two rotating periscopes mounted on top. Two visors, fitted with bulletproof glass are located on the sides of the turret. The turret may be revolved 360° to permit all-around fire.

The T-34 is powered with a 500-HP diesel motor similar in design to that in the "KV" and can be started either by electricity or compressed air.

The track also is similar to that used on the "KV." It is narrower (21 1/2 inches wide) but has the same design and method of interlinking the plates.

Carrying its normal capacity of 120 gallons of diesel oil, the radius of operation of the T-34 is 150-175 miles. However, this range may be extended by carrying extra fuel tanks strapped to the hull above the fenders.

The tank is manned by a crew of four. The commander, who also acts as loader, and the gunner take stations in the turret. The driver and radio operator are in the forward seats of the hull.

Radio is used only to communicate with higher echelons. Inter-tank communication is by visual signal, while telephone and laryngophones are used between members of the crew.

Following are data on the armament and armor of this tank:

(a) Turret armament: One 76-mm. gun (for which 77 rounds of AP and HE shells are carried). One 7.62-mm. MG mounted coaxially on the right of the gun.

(b) Hull armament: One 7.62-mm. MG in front on the right of the driver (ball mounted), one spare 7.62-mm. MG. 3,780 rounds of ammunition for the machine guns are carried.

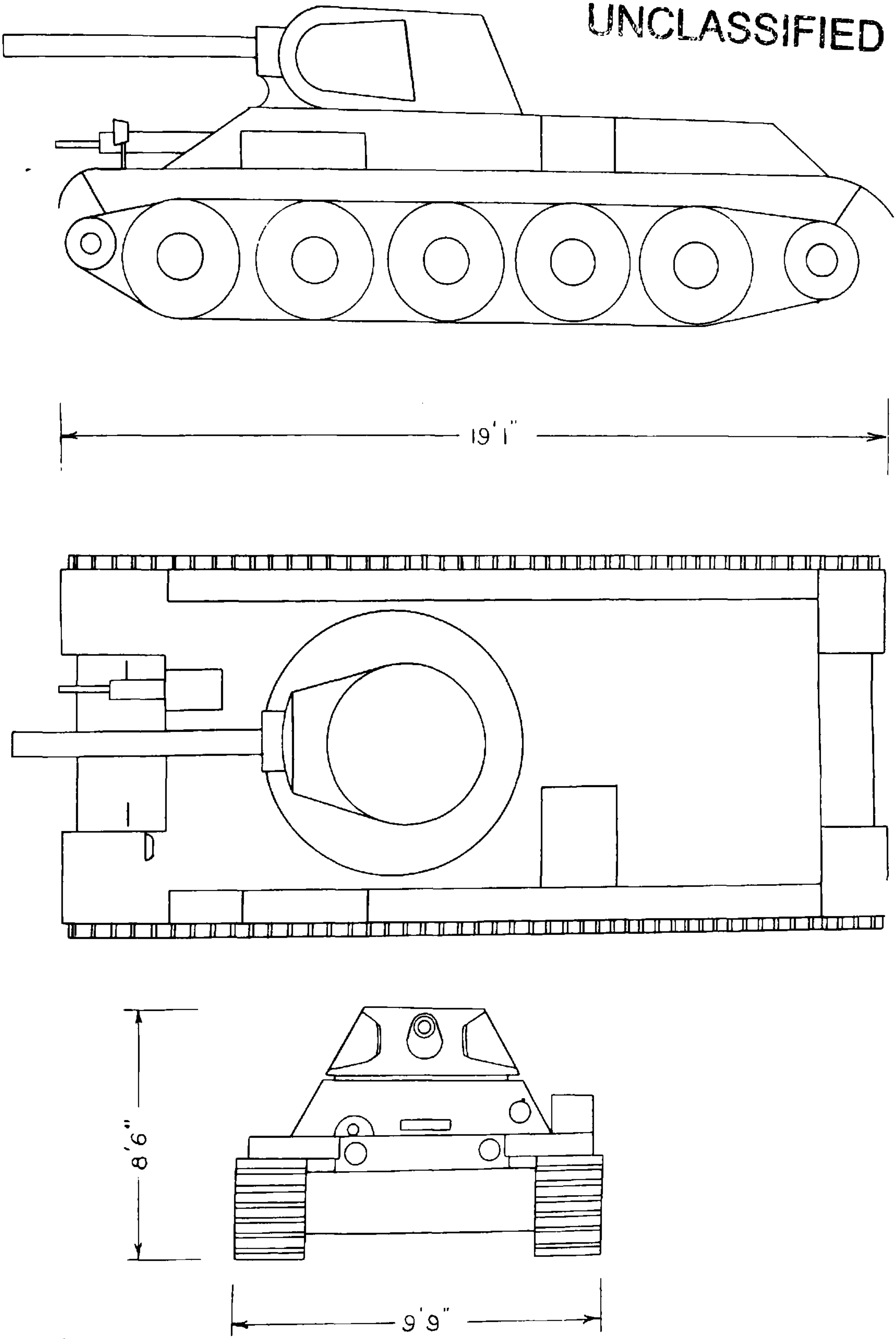
(c) Armor:

Front	50 mm.	(2.00 inches)
Sides	20 "	(.77 ")
Top	20 "	(.77 ")
Engine hood	20 "	(.77 ")
Turret sides	52 "	(2.04 ")
Rear end	45 "	(1. 77 ")

<u>The Light Tank - T-60.</u> The Soviet Light Tank (T-60) is essentially a gun carrier. It weighs 5.9 tons, carries a crew of two, and is powered with a heavy six-cylinder gasoline engine. It has a radius of action of from 75 to 100 miles and a maximum speed of 24 miles per hour. Its armament includes one 20-mm. automatic cannon and two 7.62-mm. air-cooled machine guns. The armor ranges from .6 to .8 inches in thickness.

<u>The Russian Light Tank-T-26B used as a Flame Thrower.</u> Many experiments have been conducted by the Red Army to determine the advisability of converting the T-26B (8.4-ton) tank into a flame thrower.

This tank normally carries two 7.62-mm. machine guns, or one 37-mm. anti-tank gun and one 7.62-mm. MG. If the tank is converted to a flame thrower only one machine gun can be carried.



RUSSIAN MEDIUM TANK (T-34)

On the experimental model of the T-26B, the (106-gal.) fuel tank for the flame-throwing apparatus was mounted on the tank instead of being towed on a trailer.

Various tests on flame throwers using crude oil (or some similar fuel) show that 10 gallons of fuel per second are consumed under high pressure through a 1.25-inch nozzle, to obtain a range of 100 yards. At this rate, the blast could be expected to last about 10 to 11 seconds. By lessening the pressure, the range is reduced to 25-40 yards and the stream of flame lasts longer.

The question arises whether it is worth-while sacrificing the fire-power of one machine gun for such a short-lived flame.

16. GERMAN MODIFICATION OF FRENCH CHAR B TANKS

It is reported that the Germans are modifying French heavy tanks of the Char B (30-ton) type.

The 75-mm. gun is being transferred from the hull to a new turret. This would be a logical improvement. The gun in its previous position could only fire forward. Moreover, owing to the low mounting in the hull, it could not be fired from the defiladed position, and when crossing antitank trenches the gun barrel was apt to become clogged with earth.

17. MEDICAL

STIMULANTS FOR MEMBERS OF THE GERMAN LUFTWAFFE

A firm in Brussels is reported to be the distributor of the stimulant called "Pervitin" (see page 19, Tactical and Technical Trends, No. 4) used by members of the German Luftwaffe. It is prepared in the form of a pellet or pill. The manufacturer is Temmlerwerke of Berlin. The following ingredients are used in its manufacture:

1 - phenyl - 2 - methylaminopropane hydrocloric	0.003
Saccharin lactis	0.045
Amylum	0.012

COMMENT: In this country, "Pervitin" is believed to be similar in chemical structure to our drug Benzedrine. The British consider Benzedrine and also Methedrine to be helpful in temporarily increasing physical vigor, relieving fatigue and preventing sleep.

18. JAPANESE GRENADES

Grenades are particularly useful to the close-in tactics of jungle fighting and the Japanese have used them extensively in their operations in the southwest Pacific and Burma areas, especially with grenade throwers. The following information on Japanese grenades is therefore of interest.

(a) Hand grenade. A grenade examined in Burma is described as follows (see accompanying sketch): The grenade is cylindrical in shape and has a grooved cast-iron body. A plug (10) is screwed into the top of the body through which extends a brass igniter tube (4). The striker (5) with holder (3) creep spring (6) and percussion cap (7) are located in the upper part of the tube while the lower portion contains the fuse and detonator (14). The tube is closed at the top by a light brass cover (1) crimped near the middle to fit into a groove in the tube and held in position by a safety pin (2). The safety pin supports the striker holder and prevents the downward movement of the striker on to the percussion cap. The fuse and detonator are separated by a perforated steel disk (15). The filling (16) is composed of T.N.T.

The dimensions and weights are:

Maximum diameter	1.97 in.
Overall length	3.78 in.
Weight	16.5 oz.
Weight of filling	2 oz.

Method of arming. Withdraw the safety pin. The spring is then held at half compression by the brass cover. Give the head of the ignition tube a sharp blow, further compressing the spring and driving the striker on to the percussion cap. The fuse, with a delay of 4-5 seconds, is then ignited and the filling detonated.

To disarm grenade. Remove safety pin and cover. Withdraw striker holder and spring. Unscrew plug at top of grenade and withdraw together with ignition tube. Withdraw copper tube from bottom of plug and remove detonator. Remove filling.

Variant type. A grenade examined in England sometime ago was slightly heavier, but otherwise was very similar in appearance and dimensions. A cartridge container, diameter 1.02 in., length 1.22 in., screwed into the base of the body, contained a propelling charge and percussion cap. This is presumably fitted when the grenade is fired from a discharger, probably the 1.97-in. grenade thrower, model 89.

(b) Stick grenade. A grenade of this type was examined in the Far East. (see accompanying sketch.) It is similar in design to the German stick grenade 24, the main points of difference being as follows:

 [redacted]

	German grenade 24	Japanese grenade
Length of stick	10 in.	5 in.
Length of container	4 in.	3 in.
Diameter of container	2.75 in.	2 in.
Length overall	1 ft. 2 in.	8 in.
Weight	1 lb. 2 oz.	1 lb. 3.5 oz. (approx.)
Weight of filling	6 oz. (T.N.T.)	2 oz. (Lyddite)
Thickness of casing	.08 in.	.25 in.

Both grenades are operated by a friction-igniter, powder-delay system and have a delay of approximately 4 1/2 seconds.

The thick cast-iron casing and smaller charge of the Japanese grenade indicate that it is designed for fragmentation, in contrast to the German grenade which relies on blast for its effect.

Method of arming. Remove screwed metal cap from base of stick and take out wire ring. Insert middle finger in ring and retain when throwing grenade. When grenade is thrown, cord attached to ring will be pulled out, igniting fuse which burns for about 4 seconds.

To disarm grenade. Remove the wax around the joint between stick and container and take out three screws located about 1/2 in. from the base of the container. Hold the grenade by the handle and tap off the container. Remove filling. Remove screwed metal cap from base of stick and cut cord away from ring. With a metal rod, push out igniter, fuse, and detonator complete.

(c) Armor-piercing magnetized grenades. These grenades are designed to detonate while clinging to the armor as a result of their magnetic qualities. It has been reported that the Japanese have 2 types, one shaped like a flat-sided disk, the other like a bun with a flat base. The former must be actually placed against the armor by the soldier; the magnetic qualities of the other grenade are such that it can be thrown from a distance of 10 yards, but since the flat surface must come in contact with the armor this form of attack is not likely to be successful. It is thought that these grenades are not likely to be very effective since, among other things, even a small air space between the armor and the grenade would defeat its penetrating power.

While information has been received confirming the existence of these grenades, there is no evidence that they have been used in battle.

19. GERMAN GRENADE FIRED BY SIGNAL PISTOL

It is believed that the German hollow-charge armor-piercing grenade, which is usually fired from a rifle, can also be fired from a signal pistol. This

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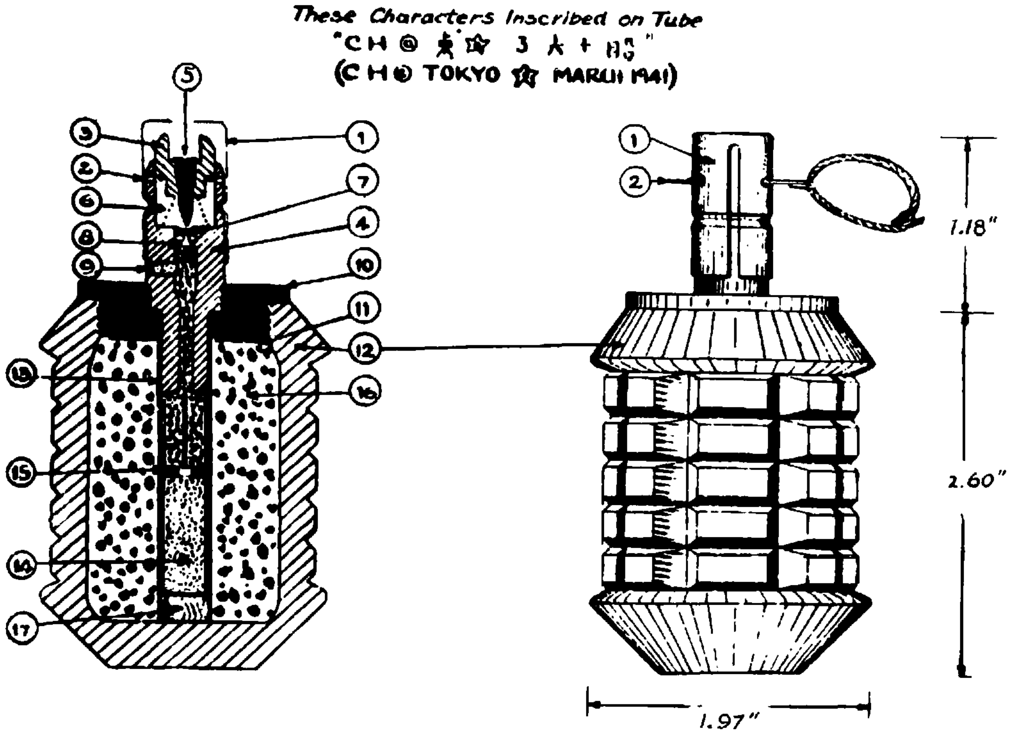
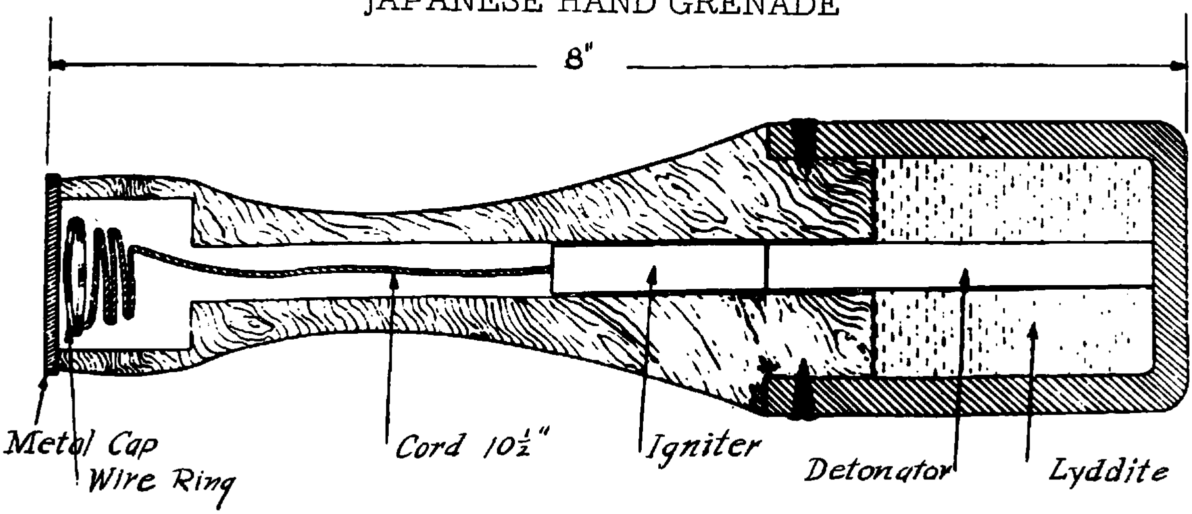


JAPANESE HAND GRENADE



JAPANESE STICK GRENADE

UNCLASSIFIED

belief is based on captured documents which have established the existence of attachments for firing grenades from these pistols.

20. 12-KILOGRAM GERMAN ANTIPERSONNEL BOMB

There are apparently two types of the German 12-kg. (26.4-lb.) antipersonnel bomb. One has walls of solid steel. The other has two concentric containers, each 0.1 in. thick; the intervening space is filled with steel pellets embedded in concrete. The inner container is coned at the base and the outer one closed by a base plate.

21. QUARTERMASTER (TECHNICAL)

WATER RATIONS

Desert warfare requires that water be used on a scale to meet the needs of the fighting forces, but within the allowable limits imposed by the scarcity of supplies.

One captured document shows the issue of water to the 11th Battalion, German Fifth Tank Regiment in Libya, as follows:

Radiator Water

Vehicle	Container	Liters	Gals. (British) approx.
Cars	1	20	4 1/2
Trucks and Mark I & II Tanks	2	40	9
Mark III & IV Tanks	3	60	13 1/2

As carried in the water supply columns these quantities are doubled per vehicle.

Washing Water

Approximately 2 gallons per man for 3 days.

Cooking and Drinking Water

The total for the Battalion is about 2,800 gallons, carried in 520 containers.

Additional Reserve

Approximately 4,212 gallons. (The total of 14,100 gallons is so high that it is unlikely to be continued for long.)

GLOSSARY

NAMES OF PLANES IN SERVICE WITH THE BRITISH

BOMBERS OF BRITISH MANUFACTURE

Heavy Bombers(1)

Halifax	4 engines
Lancaster	4 engines
Manchester	2 engines
Stirling	4 engines

Medium Bombers(2)

Mosquito	2 engines
Wellington	2 engines
Whitley	2 engines

Light Bombers(3)

Blenheim	2 engines
Hampden	2 engines

Torpedo Bombers

Beaufort	2 engines

(1) Weight empty, over 20,000 pounds
(2) Weight empty, 12,000-20,000 pounds
(3) Weight empty, under 12,000 pounds

FIGHTERS OF BRITISH MANUFACTURE

Night Fighters

Blenheim (long range)	2 engines
Defiant	1 engine

Fighters

Beaufighter	2 engines
Hurricane	1 engine
Spitfire	1 engine

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 [redacted]

BOMBERS OF AMERICAN MANUFACTURE

American Name	British Name	No. of Engines
	Heavy Bombers*	
B - 17	Flying Fortress	4
B - 24	Liberator	4
	Medium Bombers*	
B - 26	Marauder	2
B - 25	Mitchell	2
B - 34	Ventura	2
	Light Bombers*	
Martin 167	Maryland	2
Martin 187	Baltimore	2
D.B. - 7	Boston I	2
D.B. - 7 A	Boston II	2
D.B. - 7 B	Boston III	2
B - 14	Hudson	2
	Dive Bombers	
Vultee (V-72)	Vengeance or Georgia	1

*American classification and not by weight.

FIGHTERS OF AMERICAN MANUFACTURE

American Name		British Name
	Single Engine	
P - 39		Airacobra
Brewster 339		Buffalo
P - 40 B.C.		Tomahawk
P - 40 D.E.		Kittyhawk
P - 40 F		Warhawk
P - 43		Lancer
P - 66		Vanguard
P - 51		Mustang
	Twin Engine	
P - 38		Lightning I
P - 38 D.E.F.		Lightning II
D.B. - 7 (night fighter)		Havoc I
D.B. - 7 B (night fighter)		Havoc II

SECTION II

THE SIEGE OF SEVASTOPOL

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THE SIEGE OF SEVASTOPOL

(German Accounts of the Operations Against Sevastopol, June 7 - July 4, 1942)

Eyewitness accounts appearing in the German press of the operations against Sevastopol between June 7 and July 4, 1942, permit the Military Intelligence Service to reconstruct this siege operation in a detail not possible for any other operation of the Russian-German War. German press accounts term the fortress of Sevastopol the "strongest single fortress of the world" and unanimously declare neither the Maginot Line nor their own "West Wall" compared in strength with this mightiest of Russian fortresses.

The fortress of Sevastopol was initially constructed in the two decades between the years 1806 and 1825. These ancient forts showed great strength in the Crimean War, 1854 - 1856, when they held up an allied army composed of British, French, Italians, and Turks for a period of nine months. Since 1939, the Soviets devoted especial attention to the modernization and enlargement of this fortress, recognizing that, with the coming of airpower, the retention of the Crimea was all-important for control of the Black Sea. An examination of the map discloses that the island-like Crimean Peninsula lies in the middle of the Black Sea, and that an air force based on Crimean air fields can control the maritime trade routes across the Black Sea in any and all directions.

In November, 1941, the Eleventh Germany Army under General of Infantry, von Manstein, after hard fighting forced the Russian fortified lines across the Perekop Isthmus at the north end of the Crimean Peninsula. Following this penetration, von Manstein's troops advanced rapidly to the south and captured the city of Simferopol, the capitol of the autonomous republic of the Crimea. The bulk of the Russian armies defending the Crimea, then withdrew to the eastward into the Kerch Peninsula, and eventually were forced to withdraw completely put of the peninsula when the Germans captured the city of Kerch. While these operations were in progress, a group of Russian divisions, cut off from Kerch, withdrew within the Sevastopol defense lines. While von Manstein's operations against Kerch were in progress, Sevastopol was contained by a small German force.

Early in December, the bulk of von Manstein's army returned westward from Kerch and began offensive operations against the fortress. This initial attack had, at first, some success, and one of the outer forts, "Balaklava" was captured, but German offensive operations had to be completely halted, when a larger Russian counter-offensive began from the mainland. Taking advantage of their maritime control of the Black Sea, powerful Russian forces were landed simultaneously in several places on the Crimean Peninsula. The city of Kerch was recaptured, as well as the towns of Eupatoria and Feodosia to the north and east of Sevastopol respectively. The entire German position in the Crimea, for a time, appeared to be threatened. All reserves had to be thrown toward Feodosia and Eupatoria. In consequence, the German forces attacking Sevastopol retired to their blockading lines some miles in front of the outer Russian fortified lines.

From December until June, hostilities in the Sevastopol region were of a minor nature. Occasionally, local counter-attacks were launched by the

Russians, but these attained no great success. The Germans, on their part, found themselves confronted with a serious guerrilla war in their rear areas, where Russian guerrilla bands roaming the Jaila Mountains attacked German supply columns, troop headquarters, and base depots. In January, 1942, the German position gradually improved, as a result of this recapture of Feodosia and Eupatoria, and the suppression and extermination of the Russian guerrilla bands.

In May, 1942, the main body of the army of General von Manstein resumed offensive operations with a carefully planned and well-executed attack against the three Russian armies which had reoccupied (in December, 1941) the Kerch Peninsula. The German press unanimously declares that this local offensive was one of the best prepared and well-executed attacks of the entire war, and that complete success was achieved; three Russian armies being completely destroyed, and 165,000 prisoners captured. This victory, it is declared, ended for all time the Russian threat to relieve Sevastopol. Preparations for the storming of Sevastopol were at once begun by von Manstein's army, and the opening of the attack was scheduled for the first week in June. At least eight German infantry divisions, three Roumanian divisions, and one German armored division were assembled in the western Crimea for this operation.

The strength of the air force units which were assembled in the Crimea to support the ground army is not entirely clear; but it would appear, from German accounts, that its strength could not have been less than 1500 planes. These air forces were organized as the VIII "Close Support" Air Corps, and were under the command of General of Aviators, von Richthofen. A small naval force, comprising German, Italian, and Roumanian units, the largest of which were destroyers, operated as a unified fleet under the command of the Roumanian Vice-Admiral Georgescu.

As in the Cretian operation, of the year 1940, all branches of the German armed forces served as a unified command; -- a task force, under the command of General von Manstein.

The terrain within and around the fortress lines of Sevastopol presents great difficulties to an attacking army. Sharp hills and deep ravines alternate across the landscape. Vegetation is scarce. The Russians had utilized the months of the winter 1941-1942 to greatly strengthen the existing fortifications. Several deep and broad tank trenches had been constructed, barring the way to the German tanks. About 137,000 tank mines were also laid within the fortified zone. German reports state that, by May 1940, Sevastopol was defended by 19 modern forts and 3,597 pillboxes and other lesser defense installations of a permanent character.

The principal weakness of the fortress lay in the fact that it was cut into two parts of equal size by the Sevastopol Harbor, a deep and broad fjord-like channel of the Black Sea, which ran for some six miles inland. Sevastopol city lay on the south shore of this bay. Only a narrow strip of land connected the two portions of the fortress.

During the month of May, the German High Command assembled an immense amount of special material and equipment to assist their troops in overcoming the fortress' works which confronted them.

The tactical plan of campaign envisaged a deep and rapid penetration by the German ground forces of the northern half of the fortress down to the northern shoreline of Sevastopol Harbor. While this main attack was in progress, German and Roumanian elements confronting the southern and eastern fortress were expected to advance from the east and capture the Sapon Hill, an elevation which dominated the terrain between Sevastopol and Balaklava. A very important role was given the German Air Force. The Russian air units stationed in Sevastopol were perforce few in number and restricted to operation from a very few air fields. The Caucasus was too far away to permit the Russian air units stationed in that region to intervene in the fighting at Sevastopol. The neutralization of the minor Russian air units stationed at Sevastopol therefore, appeared to the German High Command a relatively simple matter. The bulk of the Air Force was, therefore, to be used to support and cover the attacking German ground forces. In particular, the Air Force was given the mission of neutralizing or destroying the permanent fortified works in the area of the fortress lying to the north of Sevastopol Harbor.

It is known that as far back as 1936, the German Air Force was developing special bombs and fuses for use against permanent fortifications. There is evidence in the German accounts of the Sevastopol operations to suggest that these special bombs and fuses were used extensively. It is also of great interest that the Germans speak of their Air Force in these operations as a "rolling barrage controlled by radio".

General von Manstein planned to use his tank forces only sparingly in the coming attack. The terrain was highly unfavorable for tank operations, and the pillboxes, antitank mine fields, and forts indicated that pioneers and infantry would prove more effective than tanks. It is German doctrine, moreover, not to employ tanks in attacks against lines of permanent fortifications.

The artillery preparation for the storm began early on June 2d and lasted until 3 o'clock on the morning of June 7th, when infantry and pioneers moved forward in the northern sector against the Russian outpost line located on the south bank of the Belbek. German accounts state that the amount of artillery employed and the intensity of fire delivered rivaled that used in any battle on the west front in the First World War. While the bulk of the fire, both from artillery and airplanes, was placed on the front lines and the Russian forts on the high ground south of the Belbek stream, the long range artillery and heavy bombing squadrons concentrated on the city of Sevastopol itself; in particular, the navy yard and the commercial docks.

Despite the intense artillery preparation, the German infantry and pioneers, as they moved forward, could do little more than overrun the Russian outpost line. By June 8th, it had become clear that further artillery and air preparations were necessary before the forts themselves could be stormed. In

particular, Fort Maxim Gorki in the extreme northwestern end of the Russian defense line, succeeded in repulsing all the infantry and pioneer attacks which were made against it. Maxim Gorki is declared by the Germans to have been stronger than any individual fort in either the Maginot Line or their own "West Wall". Its armament consisted of two armored turrets of battleship construction, each containing two 30-centimeter (11 inch) guns. Underground, there were four levels which were provided with all necessary conveniences for the garrison as well as heavily armored ammunition chambers.

While the German infantry and pioneers were advancing slowly against the line of forts south of the Belbek, other German and Roumanian units attacked the southern half of the fortress. This southern attack began on June 11th. Initially, these attacks were on merely a local scale and aimed at advancing the line in the decisive direction of Sapon Hill. So determined and skillful was the Russian resistance that this southern advance also could make only gradual progress. Great difficulties were encountered by the Germans in particular in capturing the Russian cave pillboxes built into the sides of hills and ravines.

It became clear to the Russians, as the attack developed, that the greatest threat to the fortress came from the north. In consequence, the bulk of the Russian troops were bit by bit transported across Sevastopol Harbor and thrown into the battle raging for the line of forts on the heights to the south of the Belbek.

The decision in this crucial battle came on June 18th, when German infantry and pioneers, after a very heavy artillery and air concentration, succeeded in capturing Fort Maxim Gorki. Previously, Forts Stalin and Siberia had been captured. German accounts give the credit for the fall of Maxim Gorki in equal measure to the ground forces and to the air. In particular, however, a dive-bomber pilot is declared to have sealed the fort's doom when he scored a direct hit on the southern turret of the fortress, putting it out of commission and enabling pioneers and infantry to force their way into the interior of the fortress. Here underground the struggle continued for four days until the last resistance of the garrison was extinguished.

It is thought desirable, at this time, to review the special German technique for reducing fortresses. The special weapons and the tactical methods for this mission were developed between the years 1935-1939. All infantry and pioneer (engineer) units of the German army devoted a portion of their training schedule to rehearsing attacks on modern fortifications. The time and energy spent by the Germans on this special form of warfare was believed by them to be essential inasmuch as it was their intention, sooner or later, to breach the French Maginot Line and other permanently fortified lines by a frontal assault.

The reduction of Sevastopol constitutes the crowning achievement of this "assault technique". Assault technique is a team proposition. The team--consisting of infantry, antiaircraft artillery, dive-bombers, and other elements-operates to the end of placing its engineer component into position where the

engineers can apply their explosives directly to the enemy works. The use of engineers, and engineer materials and weapons, in this strictly combat capacity is the distinguishing characteristic of German assault technique.

As has been indicated, the forts of Sevastopol were protected on all sides by dense systems of obstacles: wire, ditches, mines, and others. These obstacles were deranged and to some extent destroyed by the violent bombardments, both from the air and from artillery, which preceded the actual assaults. It was then the mission of the engineers to move forward ahead of the infantry and complete the clearing of paths through the obstacle belts. The detection and removal or neutralizing of mines must have been the most difficult part of the job. For this operation, the German engineers probably depended chiefly on distributed charges of explosives ("Bangalore torpedoes"), which, pushed ahead and detonated, "induced" in turn the detonation of nearby mines. The entire operation demonstrated once again that under present conditions in Europe, a principle function of combat engineers is the removal of obstacles, in the face of enemy resistance.

The fall of Fort Maxim Gorki opened for the Germans a path to Sevastopol Harbor. Advanced elements of the assaulting infantry reached the shoreline on June 20th. By June 21st, the last of the main northern forts (Fort Lenin) was captured. The entire city of Sevastopol and the naval base of the Russian "Black Sea Fleet" now lay under the fire of German guns. To all intents and purposes, the fortress was doomed. Nevertheless, the Russian resistance gave no indication of diminishing. Even though the struggle was hopeless, the Russian commanders and soldiers never thought of surrendering.

The German forces attacking the southern half of the fortess now began to redouble their efforts. Attack after attack was launched toward the village of Inkerman. Gradually, bit by bit, ground was gained in the direction of the city, and on June 28th, advance infantry elements succeeded in crossing Chernaya Creek and securing lodgment on the line of hills immediately east of the city of Sevastopol. Flanking fire from German artillery stationed north of Sevastopol Harbor assisted this infantry advance. Nevertheless, the Russians successfully maintained themselves on the ridge of hills west of the Chernaya for several days. It appears that General von Manstein became convinced that still further measures were necessary to end Russian resistance.

On the night of June 28-29, the German High Command launched its decisive blow;--an amphibious operation under cover of night and a dense artificial smoke screen across Sevastopol Harbor. This attack was made in conjunction with renewed infantry assaults from the east. This two-pronged assault succeeded in placing in German hands the whole of the important ridge lying west of the Chernaya. In effect, the fortress had now fallen.

The Germans gave much of the credit for the success of this attack to their skillful employment of their power-driven motor launches ("stormboats") which transported the assaulting infantry and pioneers to the south bank of Sevastopol Harbor. This boat, with its 50-horsepower motor, its 12-man

capacity, its 30-mile speed, was developed in great secrecy by the Germans during the late peace years, and has been one of the real revelations of this war. The boat was first employed in the crossing of the Vistula by the Fourth Army at Culm in September of 1939. In June of 1940, at the crossing of the Rhine near Breisach, the Germans used the stormboat in great numbers, and showed that, through such use, they had altered profoundly the tactics of the forced crossing of wide rivers. The speed with which assault waves were landed on the hostile bank was unprecedented.

The use of the stormboat in the crossing of Sevastopol Harbor at the storming of Sevastopol appears to have followed the form of the Rhine crossing. That is, the boats were organized in "stormboat companies". The crews remained with the boats, and continued to ferry loads back and forth across the bay until conventional type ferries could be put in operation.

An important supplement to the use of the stormboat at Sevastopol Harbor was the laying of a dense smoke screen to conceal the operation. Since stormboats betray their general position by the noise they make, smoke to screen them becomes especially important. It is possible that the heavy smoke screen at Sevastopol Harbor was partly, at least, a result of the considerable losses suffered by stormboat crews in the Rhine crossing near Breisach.

Conventionally, the crossing of an initial assault wave is accomplished in utmost silence, the assault boats moving normally in twilight, with muffled oars. It will be observed that in the stormboat, silence is sacrificed for terrific speed.

On July 1st, the German troops, advancing on Sevastopol from the east, captured Fort Malakhoff on a dominating height just to the southeast of the city. In 1855 it had been the fall of this fort which ended the earlier siege. Again in 1942. the fall of Fort Malakhoff ended the city's resistance. Sevastopol was occupied on July 2d.

Russian resistance still did not end, however, with the fall of the city. According to German accounts, some 70,000 Russian troops withdrew to the Khersonese Peninsula to the southeast of the city, hoping to find there the ships on which they could withdraw to the Caucasus. No transportation arrived, however, and on July 4th, the last Russian resistance ceased. Vice-Admiral Oktjabrskij, Commander of the Russian combined forces (land, sea and air) and Major General Petrov, Commander of the garrison, succeeded, however, in escaping.

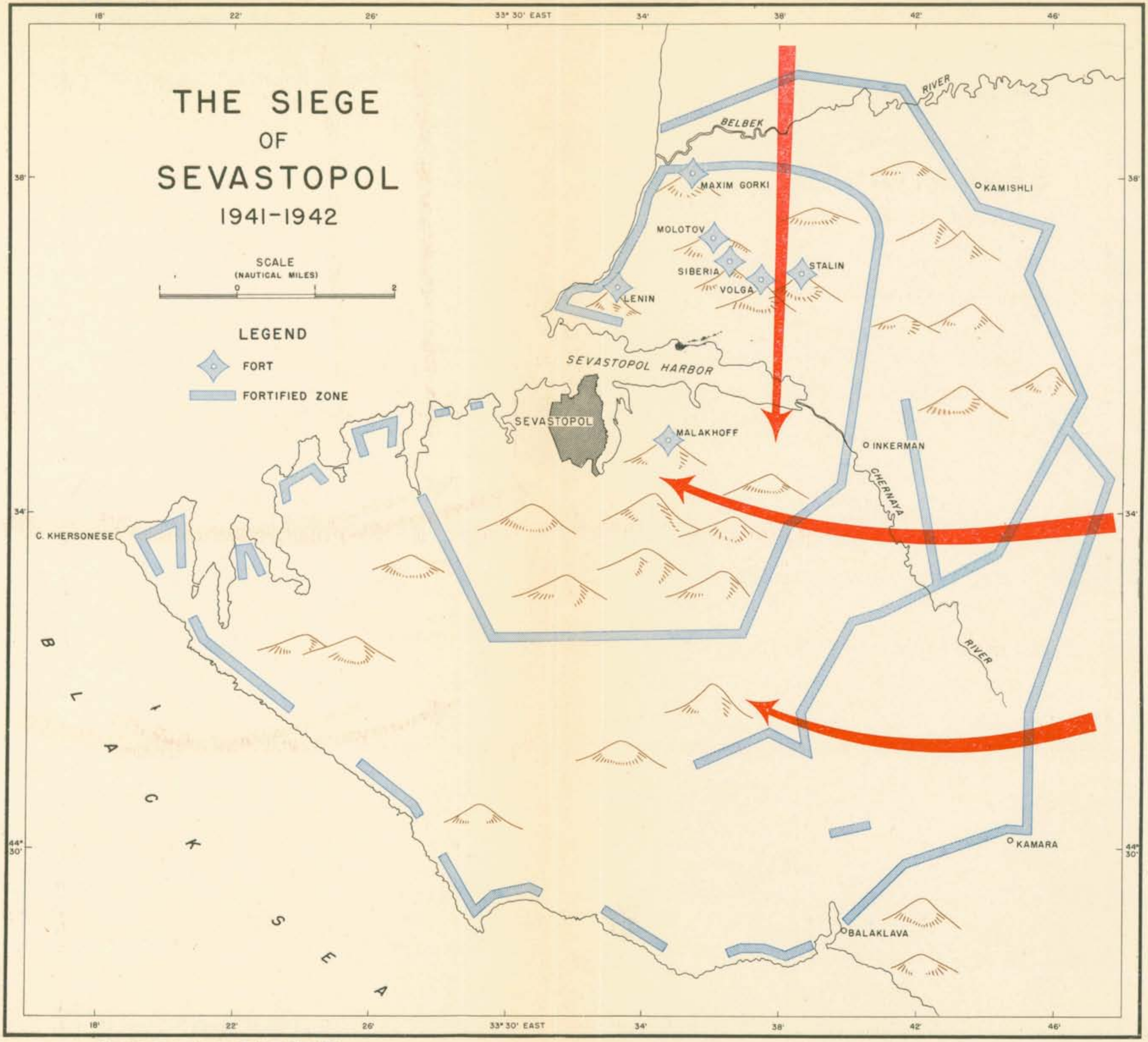
The German High Command, in its review of the fighting at Sevastopol, states that 97,000 prisoners were captured between June 7th and July 4th. They state that the loss of their own troops was as follows:

Killed:	190 officers,	4,147 men
Missing:	11 officers,	1,580 men
Wounded:	671 officers,	17,512 men

The Roumanian High Command states that approximately 2,500

Roumanian officers and soldiers were also killed, wounded, and missing during the Sevastopol operation.

It behooves the United States, which, in the course of this war, will certainly be confronted with the task of storming fortification lines of permanent character, to heed the German experience in this most bitterly contested of modern sieges:--SEVASTOPOL.



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Col. Pashley

[redacted]

TACTICAL AND TECHNICAL TRENDS

No. 6

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MILITARY INTELLIGENCE SERVICE, WAR DEPARTMENT

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To facilitate the obtaining of complete reports where excerpts only are presented in the bulletin, each item will be numbered consecutively. In referring to them, it is requested that you do so by number together with the date and number of the issue itself.

All correspondence pertaining to the bulletin should be addressed to the Evaluation and Dissemination Branch, M. I. S.

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SECTION I

TACTICAL AND TECHNICAL TRENDS

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1. FOCKE-WULF FW-190

The British were recently fortunate enough to capture, undamaged, a new FW-190 Fighter.

This is the plane the Germans claim to be the world's fastest and most maneuverable fighter. In any event it is not a copy of existing German types, but a very much improved combat aircraft.

The FW-190 is a cantilever-type, low-wing, all-metal monoplane of stressed skin construction with retractable landing gear and split flaps. A very clean-cut long N.A.C.A.-type cowling blends smoothly into a large cross-sectioned fuselage which tapers sharply to the tail.

In appearance the fuselage somewhat resembles our Curtiss P-36 and Vultee Vanguard while the wings are similar to the British Spitfire.

Powered with a new BMW (Bavarian Motor Works) 801, 14-cylinder, twin-row, air-cooled, radial engine which is reported to develop about 1,700 H.P., it is believed capable of a top speed of about 390 m.p.h. The service ceiling is estimated around 39,000 feet and the range approximately 380 miles.

Both the engine cowling and the cockpit are fully armored. The windshield is of very heavy bullet-proof glass and the fuel tanks are self-sealing.

Reports vary as to armament, but the captured plane carried four 20-mm. cannons and two 7.9-mm. machine guns.

No equipment for bombs was found but it is believed that a 2,200-lb. bomb could be carried, or that racks for smaller bombs can be fitted similar to those used on other German fighters.

2. HEINKEL HE-177 LONG RANGE BOMBER

One of the latest additions to the German Air Force is the Heinkel HE-177, a few of which have been seen in recent operations.

From available information, the HE-177 appears to be an anti-blockade, sub-stratospheric bomber that could also be used for dive bombing. Some types have pressure cabins appropriate for extremely high altitude reconnaissance.

Photographs seem to show that it is an all-metal, 4- to 6-place, midwing, single rudder, land monoplane with dorsal and tail turrets. The unusually thick wings, equipped with Fowler-type flaps, appear almost to enclose the engines. The double-wheel undercarriage has one set of wheels folding inward and the other outward.

The power plant is reported to consist of two 24-cylinder Daimler-Benz, (DB 606) "double engines" each with two 12-cylinder DB 601 units, giving the appearance, when viewed end on, of an inverted twin Vee. For economy in long-

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range cruising, one unit of each double engine may be disengaged from the common propeller shaft by means of a clutch arrangement.

High speed is estimated at 310 m.p.h. and the service ceiling at 26,000 feet. Cruising speed is about 210 to 220 m.p.h.

Cruising at 20,000 feet with a load of 13,200 pounds, the range is believed to be 1,000 miles, while with a 2,200-pound load it would be about 3,200 miles. As a reconnaissance plane without bombs, but with their equivalent in fuel, a range of 4,600 to 5,000 miles at approximately 30,000 or more feet is possible.

The large bomb compartment is said to be capable of taking two 5,500-pound bombs or their equivalent in smaller bombs or fuel, and is considered large enough to accommodate a light 3-ton tank.

The armament apparently consists of 1 fixed cannon and probably 5 machine guns.

3. GERMAN USE OF VOLTOL

Many automobile and airplane experiments have been conducted with Voltol, which greatly improves the lubricating properties of mineral oils. It is reported that most German planes shot down have carried voltolized oils, and, therefore, the assumption is that German Voltol production has been increased. The only plants known to be producing Voltol are the original small Belgian plant at Ghent and the German one at Freital near Dresden. The only question regarding future production is whether or not Germany has a sufficient amount of fatty oils available for use in making Voltol.

4. PERFORMANCE OF NEWER TYPES OF JAPANESE AIRCRAFT

Single-seated Fighters:

Japan has two types of Zero Fighters.

The Mitsubishi Zero, used in land-based operations by both the Army and Navy Air Forces, has a wing spread of 37 feet, and is short and stubby in appearance.

The Mitsubishi-Nagoya Zero (see this publication No. 5, p. 1 for detailed description) has a longer and thinner tapered wing, 40 feet in length, hinged 24 inches from the tips, which fold up for stowage purposes when carrier-based. It may also be equipped with a single float for operation as a float plane.

Although basically the same type of aircraft, the performances of these two Zeros differ particularly in the matter of speed. Both are low-wing monoplanes with retractable landing gear and powered by twin-row 14-cylinder radial, air-cooled engines. Both have a normal range of about 500 miles, but with the use of detachable belly tanks the range can be increased from 850 to 1,150 miles, depending on the size of the tanks. Both have a maximum ceiling of 33,000 feet. Both are armed with one 20-mm. cannon in each wing, with about 60 rounds of ammunition per cannon, and two 7.7-mm. recoil-operated guns, synchronized to fire through the propeller, with 500 rounds per gun. None of these fighters of either type has been reported as having any armor or being equipped with leak-proof gasoline tanks.

Of the two, the Mitsubishi-Nagoya is heavier, more powerful, and faster, with a reported maximum speed of 344 miles per hour as against 298 miles per hour for the Mitsubishi "stubby type"

Light Bomber--Single Engine:

The Mitsubishi 98 is being used extensively as a light bomber.

It is a low-wing monoplane powered with 2 twin-row 14-cylinder radial air-cooled engines. It has a wing spread of 46 feet and the latest models are equipped with retractable landing gear. The speed varies from 200 to 250 miles per hour with a range of 500 to 800 miles depending on the load. This light bomber carries a crew of two and 790 pounds of bombs and is armed with three 7.7-mm. machine guns.

Single-Engine Dive Bomber:

The Aichi 99 is in regular use by both the Army and Navy. It is a low-wing monoplane, having a wing spread of 47 feet, and a non-retractable landing gear. The speed varies from 204 to 256 miles per hour, with a range of 450 to 1,300 miles, the greater distance being obtained by means of a detachable belly tank. The armament consists of 2 fixed 7.7-mm. machine guns and one flexible machine gun of the same caliber; its full bomb load is 1,100 pounds.

This dive bomber is equipped with floatation gear when operating from carriers. Its crew consists of a pilot, and a gunner who can also serve as co-pilot and radio operator.

Medium Bomber--Twin Engine:

A newer version of the Mitsubishi T-96, known as the Zero medium bomber, has been reported in use by the Japanese Navy. It is a monoplane with two radial air-cooled engines and has a retractable landing gear.

Although full specifications and performance data of this bomber are not yet available, its speed is reported to be about 270 miles per hour, with a

maximum ceiling of 26,000 feet, and normal cruising range of 1,560 miles.

It is equipped to carry one 1,500-pound torpedo or equivalent weight in bombs. Another special characteristic is a tail turret equipped with one 20-mm. cannon. The T-96 carries a crew of two, and its armament, in addition to the cannon, consists of four 7.7-mm. machine guns.

Heavy Bomber--Twin Engine:

The Kawasaki 97 land-based army bomber is being currently used over China and India. This bomber is powered with either two twin-row radial air-cooled engines, or with two liquid-cooled engines. It is a mid-wing monoplane, and has a retractable landing gear, twin rudders, and a wing spread of 72 feet. The speed ranges from 185 to 230 miles per hour; the rate of climb has been reported as being 3,281 feet in 2.11 minutes, and the maximum ceiling with a normal load is 24,500 feet.

With 4,400 pounds of bombs the range of this bomber is 1,180 miles at 181 miles per hour for 6 1/2 hours. With 2,000 pounds of bombs the range is increased to 10 hours or about 1,800 miles. The armament consists of four 7.7-mm. machine guns and two 20-mm. cannons. It generally carries a crew of five.

This bomber is reported to be well equipped with radio, oxygen, and self-sealing tanks, together with some armor and bullet-proof glass.

5. AIR ATTACKS ON MALTA

The heavy and persistent air attacks on Malta have rightly earned for that small Mediterranean island the description "the most bombed place on earth".

Because of its importance to antiaircraft artillery, a brief review of the aerial tactics used by the enemy is presented here.

All heavy attacks were by day, with a few light raids by night. The Germans never employed straight, high-level bombing. Full use was made of the sun and any available cloud cover. The practice of feinting was used--starting to dive towards one objective and then turning to attack the real target.

Until the middle of March, with one exception, only JU 88's were used by the Germans. Later JU 87's were also constantly used. The JU 88's approached between 12,000 and 18,000 feet and came in at angles that varied between 30° and 60°, releasing their bombs at 6,000 to 9,000 feet, sometimes pulling out as low as 4,000 feet. Generally, the JU 87's dived very steeply, pulling out at the same height as the JU 88's.

The early attacks were by successive waves all approaching from the same direction and attacking the same objective. As the attack developed, the tactics varied, and synchronized attacks by waves of bombers approaching the same objective from different directions were common. The synchronization became markedly better with practice. Alternatively, heavy attacks were made simultaneously on two targets, the object in either case being to confuse the defense. Later "wingers" would peel off from the main attack to make individual attacks on heavy antiaircraft gun positions on the lines of approach or close to the target, or small formations would make deliberate diving attacks on gun positions, synchronizing these attacks with the main attack.

After delivering their attacks bombers took violent avoiding action, turning and changing height until clear of the island, and did not normally come low enough to make good targets for light antiaircraft guns. They did not attack light antiaircraft gun positions.

Bomber formations were always strongly escorted by fighters. After a raid, some of the latter would machine-gun British dispersal areas, gun positions, fishing boats, or fighters about to land. Bombers were preceded by a fighter patrol and always followed by reconnaissance from a great height.

ME 109's often carried bombs, which were dropped with accuracy from a height until special Maltese spotters (who have remarkable eyesight) were established in observation posts to identify bomb-carrying fighters so that the guns would engage them.

At least in the bombing attacks on Malta, Germans showed the trait, observed in the last war, of doing the same thing at the same time every day. During the heavy raids it was normal routine to receive an attack of about 75 bombers soon after breakfast, a second at lunch time, and a third at about 6 in the

evening. This regularity was found to be a great convenience.

6. ANTIAIRCRAFT SEARCHLIGHT DAZZLE TACTICS

Protection of German cities and strategic centers against night raids depends in part on huge concentrations of searchlights. Once a raider is picked up, sharp needles of light focus their points in a blinding cone of billions of candle power. A single light can often be shaken off with comparative ease. It is extremely difficult to escape from the effect of 20 or 30 lights pointing up at the same time.

The terms "dazzle" and "glare" are often confused with one another. Dazzle is the direct blinding effect of the powerful rays on pilot and bombardier; glare is the light interposed between observer and target in such a way that the target is obscured.

The success of dazzle clearly depends on the height of the aircraft, conditions of atmosphere, and positions of searchlights relative to the aircraft's course, and probably to some extent on individual reactions.

The following are some inferences drawn from recent trials:

a. Dazzle does not occur unless the aircraft is directly illuminated by one or more beams.

b. A single beam will not produce the effect except at fairly short range.

c. A concentration of several beams can cause acute difficulty to pilot or bombardier.

d. Head-on illumination causes far more difficulty to aircraft than does illumination from abeam or astern.

e. Short-range engagement of enemy aircraft by searchlights has apparently caused pilots to lose control and crash, but this inference is difficult to verify.

The dazzle or glare effect is most pronounced between 2,000 and 4,000 feet, and is effective up to 15,000 feet. Dazzle effect of British searchlights has in several cases brought down British fighters and bombers. British pilots report that dazzle or glare at altitudes even exceeding 10,000 feet (as used by the Germans) blinds pilots, makes location of target and accuracy of bombing difficult, impairs night adaptation of eyes, and has a pronounced psychological effect. It is most disconcerting to pilots and gunners to be thus illuminated, and rendered unable to see a fighter plane approaching to attack. The glare effect of a searchlight trained upon a low-flying aircraft is so great that it makes

low-flying attacks hazardous. The glare effect of antiaircraft searchlight beams does not interfere materially with crews of aircraft not directly in the beam; it is therefore important to keep the beams constantly on the enemy aircraft, giving defending fighters full opportunity to attack.

The Germans are reported to indicate to their fighters the course of an enemy aircraft by dipping the beam of a searchlight, or by controlled travel across the sky of the intersection of searchlight beams.

7. PREPARATION OF ANTIAIRCRAFT UNITS FOR THEATERS OF OPERATIONS

Antiaircraft units, which have been assigned for prolonged periods to the protection of cities and other establishments outside the theaters of operations, present a training problem when it is decided to send them into active combat. For example, mobility and close cooperation with other organizations then become essential, but such units obviously have had little, if any, opportunity for training along these lines. The British have evolved the following general principles for the training of such units.

(1) Organize the regiment into teams, as ready for battle, and do not change them.

(2) Teach officers and men to think for themselves and be one jump ahead of the game. Slackness and lethargy must not be permitted. Explain to all ranks that the enemy is a cunning and ruthless foe, and that to beat him requires greater cunning.

(3) A gun is useless if it cannot get there, and vehicle maintenance is essential.

(4) Learn to read and understand a map, not theoretical map reading but the appearance of the ground as it looks when you see it. Use a compass.

(5) Gun drill; accurate lining-up and levelling are essential. A gun out of order is useless and a gun not levelled and lined up serves no purpose.

(6) All officers, battalion sergeant majors, dispatch riders, and mechanics should learn to ride a motorcycle; drivers should learn to operate their vehicles with gun attached.

(7) Learn the role for which you are intended, and the role of other arms of the service.

(8) Learn to know your enemy, particularly recognition of aircraft.

(9) Learn to know yourself; physical fitness is a prime requisite.

(10) Maxims:

a. If you don't know your equipment and drill, there is no sense in going into battle.

b. If your transport breaks down you won't get there.

c. If your guns are on their wheels, you can shoot, so get into action.

d. If your guns and instruments are not lined up and levelled, there's no reason to shoot.

e. If you can't read a map, you won't get there.

f. If you're not fit you can't fight, and you'll soon be buried.

g. If you're not awake and don't know what's going on, the enemy will soon teach you, and then it's too late.

h. If you can't cook and fend for yourself in the field, nobody else will do it for you. Live, cook, eat, sleep, and wash in the open.

ANTIAIRCRAFT (TECHNICAL)

8. AIR-BURST FIRE WITH ANTIAIRCRAFT GUNS AGAINST GROUND TARGETS

It is well known that antiaircraft guns are used for direct fire against ground targets, and a recent report gives some details on their use by the Germans in indirect fire with air bursts against such targets.

Usually this type of fire is conducted by use of a mobile predictor. The ammunition used is H.E. with time fuse.

The mobile predictor is almost certainly the Kommandohilfsgerät 35 (auxiliary mechanical predictor), which is sometimes used with the 88-mm. dual-purpose gun instead of Kommandogerät 36 (predictor). The auxiliary predictor is admirably suited for mobile operations, as it only weighs about 400 pounds, was designed for ease of production and simplicity, and does not need any electrical equipment.

Apart from direct fire with the 88-mm. gun, the Germans are known to use both predictor control and fire directed from an observation post for the engagement of tanks and ground targets.

With predictor control the data for the first round are calculated in the

same way as for an aerial target. Corrections for deflection, range, and fuse setting are made from observation of fire and set off on the respective scales on the predictor.

When the target is below the horizontal, or at ranges greater than 10,900 yards, the predictor is not used, and fire is directed from an observation post. The observation post officer takes direction, range, and elevation from his fire control map. From these he calculates the gun data with a range table and passes the information to the gun position by telephone. A predictor is sometimes used for giving the original line to the guns. Corrections are ordered from observation of fire and set off on the gun.

Adjustment is carried out with air bursts with a low height of burst. Fire for effect follows with the fuse setting adjusted for the most effective height of burst.

9. EMPLACEMENT OF ANTITANK GUNS

It is essential that antitank guns be carefully emplaced and effectively camouflaged. Certain antitank guns have a very strong muzzle blast. In the desert terrain of the Middle East the force of this blast throws up a cloud of dust and sand that quickly reveals the position to enemy observers and often completely obscures the field of fire. Consequently, it is necessary to provide such guns with a blast screen. To eliminate this difficulty the device shown in the accompanying sketch has been suggested. It consists simply of a net of fine wire mesh, supported on pegs extending about one inch above the surface of the ground. The wire mesh should be so painted as to blend into the surrounding terrain. Other provisions for eliminating the dust include covering the critical areas with concrete or cement, paving the areas with stone, or treating them with oil. The areas should be camouflaged whenever the guns are not firing.

It is also necessary to make the inside of the emplacement as dustproof as possible so that dust will not be sucked up in the rush of air following the discharge.

Furthermore, it has been found essential to provide alternative positions, and to construct all emplacements so as to permit easy removal of the gun. These provisions have been found absolutely indispensable, for the fire of the weapon will inevitably betray even the best constructed position.

When the terrain permits, the gun should be defiladed from the enemy by emplacement on a reverse slope, or, if the country is flat, behind a natural or artificial mound. If an artificial mound is constructed, it should be as low as possible.

The arc of fire should be large; 180° is normal.

The gun should have overhead camouflage, but covering should be constructed so that it can be easily removed when there is need to close station rapidly

In general conception the emplacement should be an open pit of minimum dimensions.

10. BRITISH ANTITANK GUNS IN BURMA

A British officer gives the following account of the use of British two-pounder (40-mm.) antitank guns in Burma:

"I was on a road in Malaya when I heard the sound of an approaching Jap tank, so I took cover in the rubber trees close beside a well-concealed two-pounder antitank gun. Another gun equally well-concealed was located about 100 yards up the road. The Jap tank came around the corner and moved down the road at about 12 m.p.h. swaying from side to side. The gunners allowed it to pass while some distance behind came another. The leading gun opened on the latter

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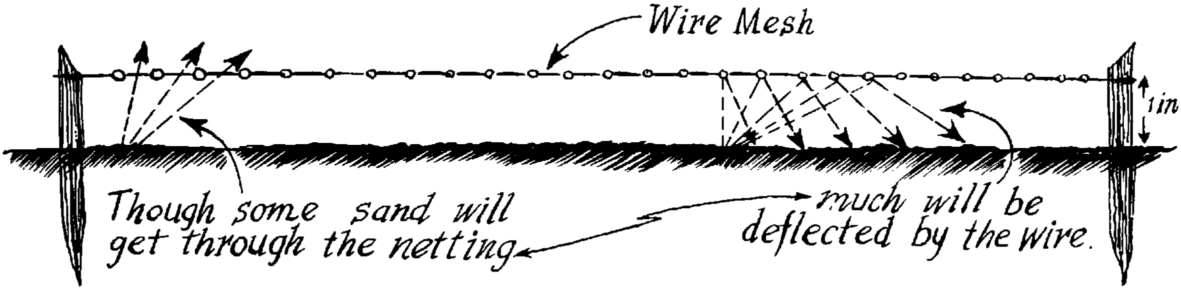
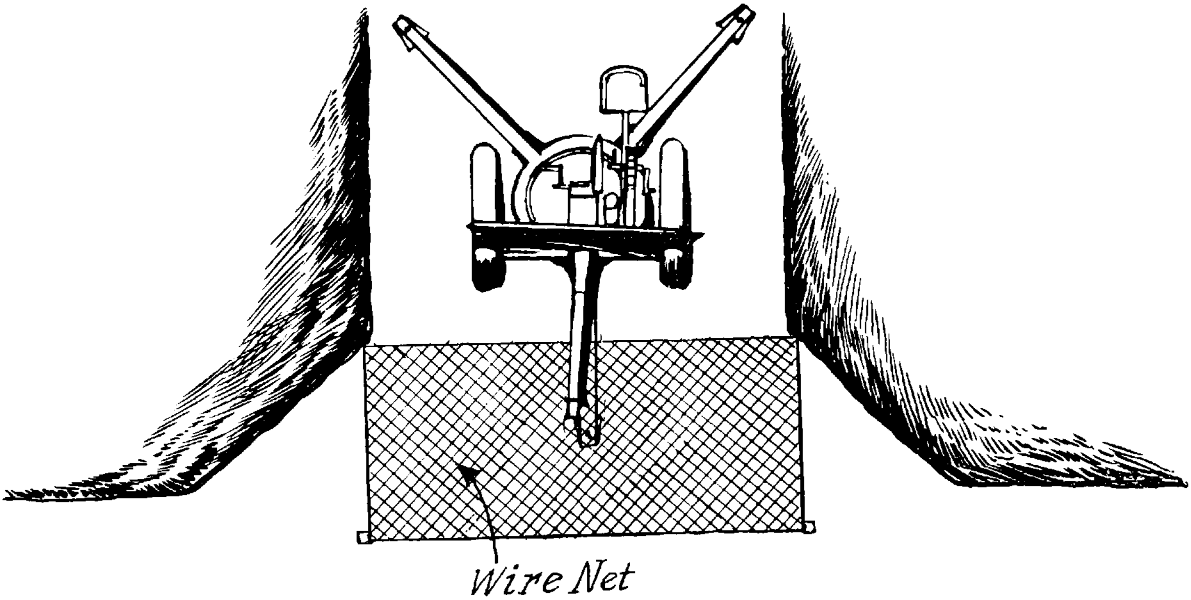




ANTITANK GUN EMPLACEMENT

at about 400 yards range and it immediately swung in the direction of the gun. The rear gun at once put four shots rapid into the exposed side and all was silence.

"I went with the gunners to examine the tank. The shots fired by the leading two-pounder against the front of the tank had merely dented the armor and not penetrated. Of the four shots in the side, two had gone right through both sides, and two had caused the armor to break and flake.

"The gunners, very experienced, said that their guns never had any effect on the front of a tank which was heavily armored. They always fought their guns in pairs. The leading gun attracted the tank's attention and the moment it swung and exposed its thin sides the rear gun knocked it out. They said it was just too easy. In this action the leading tank was dealt with down the road. The crew of the tank were three, two in front and one in the turret to operate the guns. There was a mantlet around 75 percent of the bottom of the turret which, I assume, was to protect the turret ring. There was a thick piece of loosely swung armor between the tracks at the bottom of the tank. This presumably, was to protect the belly of the tank when exposed as a result of climbing some obstacle."

BRITISH COMMENT: The tanks involved appear to have been modern light tanks possibly with additional protective armor fitted. The mantlet referred to in this report is evidently a splash ring.

ARTILLERY (TACTICAL)

11. NOTES ON GERMAN DIVISIONAL ARTILLERY

The organization of the German divisional artillery, like that of our own, includes three battalions of 105-mm. howitzers, which ordinarily operate in direct support of the three infantry regiments, and one medium battalion. The medium battalion is composed of 2 batteries of 150-mm. howitzers and 1 battery of 100-mm. guns, and operates in general support of the division. There is also an infantry cannon company composed of six 75-mm. howitzers and two 150-mm. howitzers. In addition, in each armored and motorized division as well as certain assault infantry divisions, there is one armored assault artillery battalion composed of three 4-gun companies armed with self-propelled 75-mm. or 105-mm. howitzers.

In addition to this artillery there is in every division an artillery observation battalion which is composed of a sound-ranging battery and a flash-ranging battery (each separable into 2 independent platoons), a survey battery, a reproduction platoon, a signal platoon, and a meteorological section. This battalion works directly under the division artillery commander.

In general, the tactics and technique of German artillery are very similar to our own, but a recent report on cooperation between German artillery and

other arms brings out several interesting divergences as well as some slight differences in emphasis.

All artillery orders are given orally at first; later those of the regiment and the division, particularly the latter, are confirmed and expanded in writing. The divisional artillery commander's order is not issued as an annex to the division order, but as a separate artillery order. Great stress is placed on the use of fragmentary and warning orders, and the Germans also emphasize that wherever possible orders should be given on terrain affording suitable observation rather than by reference to a map.

Counterbattery missions of the divisional medium artillery are heavily stressed. While counterbattery is primarily the task of the medium battalion, the other three battalions may often take over this function. The presence of the observation battalion is one of the reasons for emphasis on counterbattery as a divisional artillery function.

Great emphasis is also placed on the battalion as the fire-control unit, and the separation of the battalion into independent batteries to be used as attached artillery is never recommended except in extremely large sectors, or under very difficult terrain conditions such as thick woods.

In the preparation and conduct of fire, simplicity of technique is the goal. Generally a standard method is prescribed and followed, and variations are discouraged. This is typical of all German technique in that they deliberately adopt a simple method which will fit the large majority of cases, and consider that the gain in simplicity is more important than the loss of several highly refined techniques, each suitable for only a few complex situations. Reciprocal laying with the aiming circle is apparently the method most frequently used. It should be noted that this standardization of technique is in contrast to the general tactical doctrine of the Germans, which insists upon the uniqueness of each problem and the necessity for working out a complete and independent solution rather than applying a rigid prearranged formula.

Communications are normally by wire, and the use of radio is limited to periods of displacement. The one exception to this is the radio communication between observation posts and gun positions.

In preparation fires each battery normally covers one or more targets, each about 110 to 165 yards in width. At all times emphasis is placed on flexibility of fire plan and procedure, particularly by using irregular surprise fires on infantry and artillery, and on enemy command posts, as well as on the point of intended penetration.

The following table shows the maximum rates of fire consistent with efficient maintenance of materiel:

 [redacted]

Weapons	Short bursts (rounds per minute)	Prolonged fire (rounds per minute)
100-mm. gun	5	1 1/2
105-mm. howitzer	6	2 1/2
150-mm. howitzer	4	1 1/3

Except in unusual circumstances the artillery "reserve" consists of a large supply of ammunition rather than uncommitted units.

In order to secure greater effect against personnel in the open, ricochet fire is deliberately sought by use of delayed fuse. With light howitzers ricochet is believed to be always obtainable up to an angle of impact of 270 mils, and usually obtainable up to 360 mils. The adjustment is secured with quick fuse, and fire for effect is conducted with delayed fuse. If for any reason the richochet fire does not prove effective, fire for effect is continued with quick fuse.

The Germans believe in a "lone gun", placed at a sufficient distance from the rest of the battery so as to appear to be an entirely different position. This gun is used for harassing fire, fire against high targets, determination of weather corrections, and finally to deceive the hostile observation as to the true position of the battery.

It is essential that supported infantry commanders be generally familiar with the characteristics, capabilities, and limitations of artillery in order to secure most effective cooperation. They must understand: that the effectiveness of artillery depends to a great extent on the neutralization of enemy artillery, and that consequently some of the fire must be employed on counterbattery missions; that the ammunition supply is limited, and the laying of heavy concentrations on important areas means a loss of fire on less important ones; that the artillery should engage only those targets which justify its heavy fire; and finally that unnecessary or too hasty requests divert artillery from its principal missions and destroy mutual confidence.

One factor which insures that infantry commanders will be familiar with artillery capabilities and limitations is the presence of the infantry cannon company in the infantry regiment. This cannon company's presence also has several other effects. First of all, it settles the problem of the accompanying gun. Second, artillery is relieved of many small but difficult direct-support missions and is released for its larger missions. Third, and most important, it lessens the artillery-infantry gap which liaison officers are intended to bridge, since it means that the liaison is not between two distinct and separate units of artillery and infantry, but rather between the regular artillery of the supporting battalion and an infantry unit which already has organic artillery weapons. There is coordination of fire plans as well as mutual observation by the cannon company and the artillery. Also the divisional observation battalion lends its assistance to the infantry cannon company.

It is essential that the infantry regimental and battalion commanders

assist their cooperating artillery commander by continually informing him of the infantry plan of action, the infantry's progress, and its need for artillery support.

Infantry company, battalion, and regimental commanders are made "artillery minded" by being constantly trained to rely on artillery support to the utmost.

A very important function of the infantry is to seize and hold the forward locations necessary for artillery observation, thereby facilitating the artillery support. Likewise, the infantry should be informed of the positions of the artillery forward observers, observation posts, and command posts.

Finally, the closest support between the two arms is secured by having forward artillery observers operate with the advance infantry units. Forward observers with pack radio sets are believed to be the only effective means of obtaining satisfactory observation. Sets are used both by individual batteries and by battalions, and quite often the battery commander himself will act as forward observer, particularly at the beginning of an engagement when he is not familiar with the terrain. Alternate positions for all observation posts are stressed, and, as one of our observers reports "It is impossible to exaggerate the emphasis German doctrine puts on movement of observation posts and improvement of observation."

COMMENT: In summation the above article points out the following noteworthy features of German divisional artillery:

1. Early counterbattery fire by divisional artillery.

2. Use of battalion as a unit.

3. No set pattern for fire plan in preparations.

4. Ricochet fire.

5. Use of roving gun for registration, harassing fire, and deception.

6. Education of commanders of supported units as to value of--
   a. Neutralizing enemy artillery.
   b. Conservation of ammunition for important missions.
   c. Necessity for observation.

7. Close support through forward observers with advanced infantry, rather than through liaison detachments with supported unit commander.

12. GERMAN USE OF SMOKE

Research on German use of smoke as a weapon has produced considerable information on the organization of German smoke units and the large-scale use of smoke in tactical roles.

The idea that climatic conditions in the Middle East made the use of smoke impracticable has been proved by experience to be incorrect. Conditions will vary, but it will frequently be possible to use smoke effectively.

German Smoke-Producing Units (Nebelwerferabteilungen)

Six of these units have thus far been identified in the German Army. It is possible that eventually each Corps will include a smoke-producing unit. These have been identified in regimental chemical headquarters but only as administrative, non-operational headquarters.

Engineer Units. These are believed to be equipped with smoke projectors manned by sections of two to three men. The scale of equipment is not known.

Employment of Smoke in the Field. Captured documents point out the danger of interfering with neighboring troops and supporting weapons. There is also the difficulty of observation. Because of these elements, unless a smoke screen can be guaranteed to affect a particular sector only, its use must be directed by a superior commander.

Army and corps commanders allot smoke troops, equipment, and ammunition to subordinate formations for large-scale screening operations. The divisional commander usually decides on the use of smoke, and its exploitation by artillery fire and troop movements. In employing smoke heavy concentrations are usually sought. The following uses are quoted:

(a) Attack

(1) Concealment of forward movements, and initiation of surprise attacks.

(2) Reduction of casualties.

(3) Assistance in taking open ground

(4) Covering river crossings.

(5) Blinding enemy positions and observation posts.

(6) Economy of ammunition, and reducing artillery's task.

(7) To some extent replacement of covering fire.

(8) Assistance to the main effort of the attack.

(9) Concealment of weakness in the secondary attack or of gaps in the attacking forces.

(10) Protection of flanks.

(b) Defense

(1) Blinding enemy observation posts.

(2) Concealing activities in the main line of resistance.

(3) Concealing troop movements to prevent observation from ground and air.

Throughout German teaching it is emphasized that smoke must always be laid on the enemy and not on friendly troops. The normal use of smoke to assist daylight withdrawal and to blind the enemy is also mentioned.

An interesting use of smoke is found in the suggestion that screens might be put down purely as a deceptive measure to mislead the enemy as to intentions.

The following principles are laid down for German troops when fighting in smoke:

(1) Smoke impedes defense rather than attack.

(2) Route-finding by compass is essential.

(3) Units should be guided through pre-assigned sectors.

(4) Close combat is decisive.

(5) Careful preparation of fire plans is essential in defense.

(6) Particular points of danger should be protected by units armed with bayonet.

(7) Counterattack should take place, as a rule, after the dissipation of a smoke screen.

(8) Gas masks should be worn until it is definitely known that no chemical warfare gas is mixed with the smoke.

It should be noted that no distinction is made between smoke laid down by enemy or friendly troops.

Instructions have been given for the handling of "smoke acid", which has been described as a mixture of chlorosulphonic acid and sulphur trioxide.

It is said that smoke acid is extremely corrosive and must not be used on exercises involving other than chemical warfare troops. It burns through uniforms, eats into the skin, and burns all crops. It must not be used in areas occupied by friendly troops or areas which they intend to enter during the smoke laying. Anticorrosive suits, and either anticorrosive masks or gas masks without filter, must be worn when handling smoke acid.

Equipment

(a) Smoke Candle Nb K 39. This is used to lay small local screens of short duration. It consists of an air-tight, water-tight container filled with a smoke-producing agent ignited by means of a fuse. The candle weighs 1.8 kgs. (about 4 pounds) and is fitted with a carrying handle. It is intended to be placed on the ground and ignited, or thrown by hand or by means of a sling passed through the carrying handle. For ease of throwing, a 30-cm. (11 3/4 in.) stick, to which the handle is attached, may be fitted. The safety pin must be withdrawn before the apparatus can be ignited.

The candle burns for 4 to 7 minutes; the density of the screen is increased if two are placed together, although more than two must never be used together since the heat generated raises the screen. The best effect can be obtained if these candles are used in quantities.

(b) Smoke Hand Grenade Nb Hgr. 39. This weapon approximates in appearance the normal stick grenade, but is filled with the same type of smoke-producing agent as the smoke candle Nb K 39. Its weight is 0.850 kgs. (1 3/4 pounds). The smoke is produced approximately 7 seconds after the pin has been pulled out, and lasts for 1 to 2 minutes.

(c) The Improvised Smoke Projector. This weapon can project the Smoke Candle 34, up to a range of 500 meters (550 yards). It consists of a steel barrel, 94 mm. (3.7 in.) in diameter, 4 mm. (.157 in.) thick, and 600 mm. (23.62 in.) long. The base plate, 200 mm. (7.87 in.) square and 10 mm. (.39 in.) thick, is welded on. A bipod is attached to the barrel by a ring just behind the muzzle. The best results are produced when using an elevation of about 45 degrees, which gives the maximum range for any of the three charges which may be used. These charges are made up of 25 (.54 pound), 50 (1.08 pounds), and 100 (2.16 pounds) grams, respectively, of propellant explosive in small packets of gauze or cellophane. The method of operation is to insert the charge into the barrel and drop in the smoke candle with the safety pin already withdrawn; this ignites the charge and the candle is projected to a distance depending on the charge, the angle of projection, and the wind. The rate of fire is 3 r.p.m. The average ranges attainable are:

With 25 grams propellant	100 meters (110 yards)
With 50 grams propellant	200 meters (220 yards)
With 100 grams propellant	500 meters (550 yards)

The most effective use of this projector is said to be the engage-

ment of entrenchments and dugouts, and as a covering for river crossings. It can' be mounted in the assault boat issued to engineer units.

(d) Tank-Mounted Smoke Candle Rack. All German tanks carry, projecting from their rear, a rack on which 5 smoke candles are held. These candles cannot be projected but are dropped from inside the fighting compartment. No definite evidence on their effect has yet been received.

A captured German General Order dated April 1942, mentions the fact that the smoke-candle discharger apparatus fitted to tanks has not proved successful and that a new type is being designed.

(e) Smoke-Producing Agents. For smoke candles and grenades a solid substance composed of zinc powder and hexachlorethane is used. This is quite normal. The shell is said to contain sulphur trioxide, but a 75-mm. shell which has actually been examined was found to contain oleum. Certain types of smoke generators sometimes use chlorosulphonic acid in conjunction with oleum or sulphur trioxide. In this connection, there have been two recent reports from the Western Desert of a thick cloud over 100 yards deep having the appearance of chlorine, but not in fact composed of this gas. The cloud was said to be used tactically on both occasions, and to be heavier and more intense than clouds normally caused by smoke-producing apparatus. In appearance, however, clouds produced by chlorosulphonic acid could be mistaken for chlorine.

The average height of a normal smoke screen is said to be 10 to 15 meters (32 to 49 feet), and the width 25 to 30 meters (82 to 98 feet). The length is:

Smoke Candles and Sprays	200 - 300 meters (220 - 330 yards)
Smoke Shell	100 meters (110 yards)
Smoke Hand Grenades	30 - 50 meters (33 - 55 yards)

German teaching is that the most effective height from which aircraft can release smoke is 120 to 150 feet or less. Morning and evening (particularly twilight) are recommended as the most suitable times, and little or no wind is considered an advantage. The most favorable conditions for laying aerial smoke screens are the highest possible air humidity, cloudy weather, a temperature not lower than 5° C. (41° F.) and a wind speed for smoke producers of 6 to 21 ft. per second, and for smoke bombs from 9 to 18 ft. per second.

German manuals warn their troops that a smoke screen laid by enemy aircraft must immediately be countered by a reconnaissance, as it may mean a gas attack. It is very probable that the Germans themselves might utilize this form of deception in chemical warfare.

Smoke screens by aircraft are recommended as a means of obstructing enemy antiaircraft defenses as well as of concealing targets from opposing reconnaissance aircraft. Provided that rapid and reliable advance information of the movements of enemy bombers is available, the employment

of such smoke screens against actual air attack is also taken into account.

Blinding observation posts and machine-gun posts, obstructing cooperation between the enemy's artillery and infantry, covering withdrawals, and cooperating with naval units in screening ship movements and guarding damaged ships are some of the other functions prescribed by the Germans for their smoke-laying aircraft. It is believed that such aircraft, flying below troop-carrying planes, sometimes emit a smoke cloud through which parachutists descend. Parachutists in Holland are reported to have carried smoke generators.

Large-Scale Use of Smoke.

In screening targets covering a considerable area, smoke has been used to a large extent by the Germans for over a year. As early as March 1941, reports were being received of large-scale smoke generators, and it was known then that E-boats were equipped with a smoke apparatus having a gross volume of 20 gallons. In the report of actual use of this apparatus, particular reference was made to the remarkable rapidity with which the smoke was generated, and to its persistence. The smoke was believed to be produced by chlorosulphonic acid. At about the same time two reports were received from R.A.F. pilots of smoke screens which they had observed over Berlin. Smoke started from a series of straight lines E.S.E. of the city. It produced an effective screen estimated at two miles wide, stretching across the city N.N.W. beyond the Tegeler lake 15 miles distant from the source, the effective length being estimated in one report as 20 to 30 miles. Another report said that the screen was very dense, effectively covering the town, and that the smoke appeared to come from containers roughly 20 yards apart, quickly merging into one continuous smoke screen. The cloud was dark gray in color.

In January 1942, a captured document disclosed the existence of an apparatus described as the Smoke Generator 41. This was to be used, according to the document, for screening large areas, or for screening for prolonged periods (up to two hours) single buildings, bridges, battery positions, etc. The generator was strong and simple and contained 20 gallons of smoke acid.

The most exact knowledge of German large-scale use of smoke comes from the Brest area where detailed information has been received from reliable sources. Apparently the screen here is put up immediately on the sounding of an air raid warning, and within 20 minutes the docks and town are completely enveloped in smoke. It is reported that the screen is so dense that visibility on the ground is only a few yards. The generators appear to be fairly simple, and alongside each generator there is a 40-to 50-gallon drum for recharging. By this means it is considered that the smoke screen can be maintained at full strength for some hours, and on one occasion the screen was in fact maintained throughout a raid which lasted 4 hours. The apparatus is served by army personnel, three to each generator. The generators and recharging drums are brought up in trucks and placed in position at dusk in the streets around the town and docks, on the breakwaters, and as far as the suburbs of St. Anne (Portzec). In addition about 20 small motor fishing craft, (10 to 12 tons) each equipped with

one of these generators, put out at dusk into the middle of the Rade de Brest to screen the wharves. The generators on land are collected by trucks every morning. The smoke itself is described as issuing from the generator in the form of a liquid which immediately vaporizes. It is the color of tobacco smoke, and is odorless and harmless although a little irritating to the throat. If any of the liquid is spilled on the ground everything with which it comes into contact is burned, and grass and green leaves are turned yellow. From the description given there can be little doubt that the charge is either oleum or chlorosulphonic acid, or a mixture of the two. The dimensions quoted for the genêrator indicate a capacity of 40 to 55 gallons; allowance for air space reduces the actual quantity of liquid.

It is known that the German firm of Stolzenburg and the Czech firm of Chema have produced generators of the type used at Brest, ranging in capacity from 22 to 55 gallons.

Smoke has not been used so far on an extensive scale by any of the other members of the Axis.

CHEMICAL WARFARE (TECHNICAL)

13. NEW TYPES OF GERMAN INCENDIARIES

During the last week of July 1942 the Germans used three new types of incendiary bombs.

1. The first type is basically the usual 1-kilo (2.2 lbs.) German incendiary, but is designed for greater effect against personnel. It also has greater penetrating power against buildings. Whereas the earlier-type bomb had an explosive charge in the tail, the new type has a fuse and a more powerful charge contained in an extension fitted to the nose. The total length, exclusive of the tail, is 17 inches; total weight, 5 pounds. The time interval between the igniting of the incendiary and the detonation of the explosive charge depends upon the fuse setting, and may be up to 5 minutes, or even more. The explosive charge sometimes breaks off and detonates separately. At a distance of 20 yards from the point of detonation one is reasonably safe if lying down. Thin wires, with a 2-inch disk attached at one end, and about 18 inches long, found at some distance from the point of impact, are an indication of this type of bomb. These wires are released by the bombs as they fall from their container.

2. The second type is a combination incendiary and H.E. bomb with 12 pounds of T.N.T. in the nose. This bomb has a casing like that of a 50-kilogram H.E. bomb, and the usual type of fuse to split open the casing on impact. As the bomb hits it throws out about 60 metal containers with a thermite-type filling and 6 preignited fire pots of the magnesium electron type. Immediately thereafter the T.N.T. detonates. The thermite containers are about 2.25 inches in length, and triangular in section with about 1-inch sides. The fire pots are shaped

like a large tumbler; they are 5.75 inches in length, 3.75 inches in diameter at the top, and 2.25 inches at the base.

3. The third type of incendiary has the same casing and fuse as the second. This bomb contains oil, rubber, and phosphorous in a sticky liquid form which is scattered 20 to 30 yards and ignites spontaneously.

Method of Handling.

It is reported that these bombs should be handled as indicated below. The methods described, however, are tentative only.

1. In combating the bomb first described it must be remembered that the explosive and incendiary parts may be at some distance from each other. If the bomb hits where it may start a fire, sand mats may be used (1) after the explosive has detonated, or (2) when application immediately after impact is possible and cover can be taken at once. Application of sand mats should not be attempted under any other circumstances; otherwise, a jet of water should be used from behind cover which would give protection against a 4-pound antipersonnel bomb--as, for example, a brick wall. If the bomb strikes where it will not start a fire one should wait 5 minutes before attempting to dispose of it. As indicated above, one is reasonably safe if in a prone position at a distance of 20 yards from the bomb. Duds should be handled with care and, if stored, placed in a horizontal position.

2. After the detonation of the TNT, the incendiary elements of the second type of bomb should be handled like the usual 1-kilogram incendiary.

3. In the case of the third type the initial safety precautions are the same as for the first type. The bomb having burst, the scattered contents should be attacked with sand, stirrup hand-pump, buckets of water, etc. Since phosphorous may reignite, equipment and clothing splashed with it must be kept thoroughly wetted until removed. If phosphorous gets on the skin the affected area should immediately be placed in water, or a wet pad applied.

14. ENEMY ANTITANK MINE FIELDS AND BOOBY TRAPS IN AFRICA

The following is a report on an enemy minefield encountered by the British during the fighting in Libya in late 1941.

All the mines were German Tellermines, which are antitank mines shaped like a plate and weighing about 11 pounds.

Many of these mines had pull-igniters screwed into the bottom as anti-lifting devices, and occasionally mines were laid upside down to increase the difficulty of disarming the main fuse. The mines were laid at very irregular intervals, but always on or near a desert trail. The mines laid across trails were generally marked with small piles of stones at the corners of the field. Mines were also laid along trails and these were apparently marked by piles of stones at either end of the mined section.

In some instances, places where mines were laid showed signs of the earth having been disturbed, but in others there was no such indication of mines because the ground had become smooth and sun-baked, owing to rain and sun.

Where trails ran through scrub, loose pieces of scrub, sometimes with booby traps attached, were placed on top of the mines as camouflage.

In several places a single strand of wire had been strung on tall stakes marked with warning or notice boards. These boards carry the inscription "ACHTUNG MINEN," or "ATTENTIONE MINA," or "ATTENTION MINES." The wire itself, although attached to booby traps, did not protect live minefields, which were invariably placed to one side of the wire, approximately in prolongation of it.

Dummy minefields were also encountered; these were completely wired in, and contained tins sunk into the ground with occasional booby traps attached to them. Gaps between dummy minefields were invariably sown with live mines.

A notice board with skull and cross bones painted on it always indicated booby traps. (This must not be taken to mean that all German booby traps are marked; the contrary is generally true.) These consisted of small standard charges ignited by standard German pull-igniters. The igniter may be attached by fine binding-wire to stakes in a wire fence, direct to the wire, to trip wires placed a few inches above ground, to stones which support stakes, or to the notice boards themselves. Booby traps also were generally laid in the scrub on either side of the trails. Occasionally a second booby trap was placed underneath the first to make the removal more difficult.

Booby traps could be detected by close scrutiny for anything out of the ordinary, i.e., notice boards facing, or in sight of, the enemy, loose strands of wire, sticks with wire wrapped round them, old explosive wrappings, etc. Stakes with booby traps underneath them were normally dug in, while others were driven in. White wood stakes protruding 6 inches above ground and connected by inconspicuous trip wires were sometimes found. These could usually be

identified by the presence nearby of small excavations, containing explosive.

ENGINEERS (TECHNICAL)

15. MINE DETECTOR OF THE RED ARMY

In tank warfare the Russians have discovered that the Germans attached particular importance to the use of mines. During the winter campaign, when the Russians were moving ahead slowly in some sectors, the work of the mine-detecting crews and the sappers was highly important. Some mines could be located by the small mounds of earth left after planting them, but in clearing a suspected area a "mine detector" was generally used.

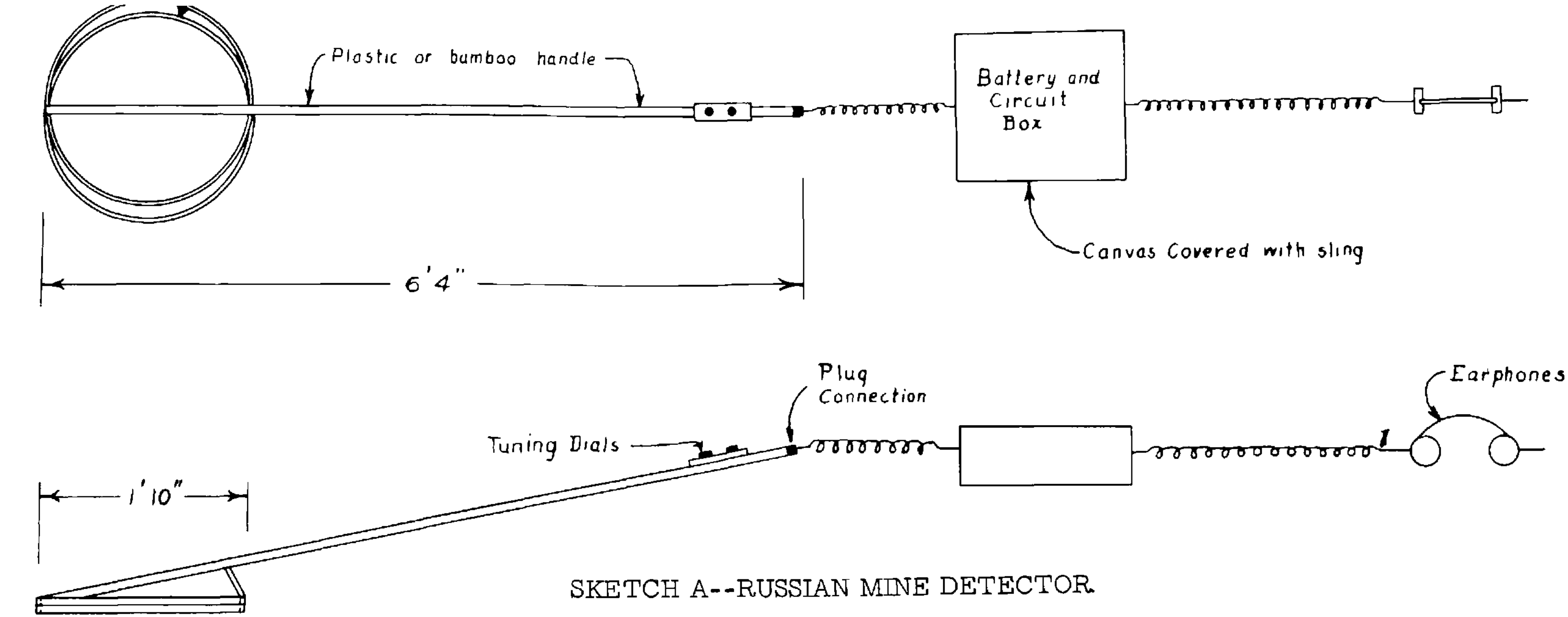
The detecting instrument is a light tubular bamboo or plastic rod at one end of which is a metal ring about 1' 10" in diameter, bound with tape. At the other end is a small wooden box containing a 3-tube amplifier, batteries, a terminal board, and earphones. The box is carried in a haversack. The total weight of the box and rod is 18 3/4 lbs, (see sketch A).

The operation of the detector depends on the change in capacity which takes place when a mass of metal enters the magnetic field set up by the instrument. This change in capacity upsets the frequency ratio which is established between the circuit in the detector ring and the circuit in the amplifier when the instrument is tuned, and thus alters the tone emitted by the earphones (see sketch B).

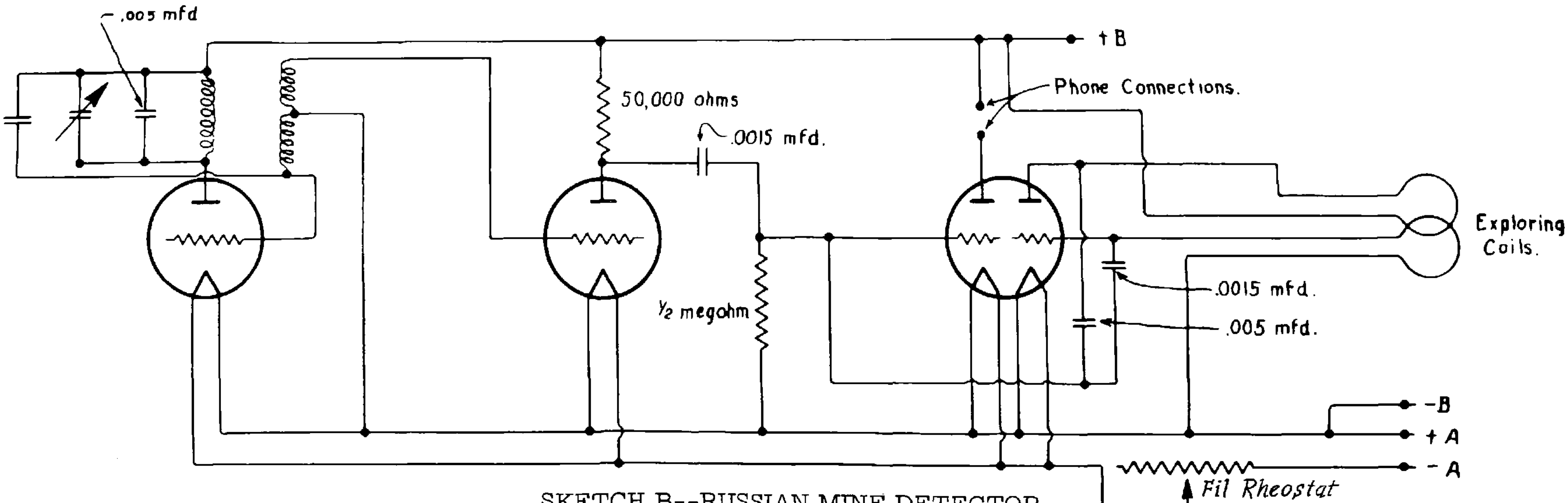
When the sappers are called upon to locate mines they usually form a line with individuals 3 to 5 yards apart. Each man carries his "mine locator" puts on his earphones, and adjusts the tuning dials until a steady low buzz is heard. He then advances over the area to be searched with the rod in front of him so that the ring is only a few inches above the ground. When the ring passes over, or near, a mass of metal concealed in the ground or snow, the buzz rises in intensity of tone or fades out altogether. The exact position of the mass can be found by passing the rod backward and forward over the suspected area until the point of maximum interference with the magnetic field is found.

The sapper marks the location of the mine and moves forward. The follow-up crews, which are usually 40 to 60 yards to the rear, excavate the mine and remove the detonator. Although mines have been found planted in rows and checkerboard pattern, generally they are placed at irregular intervals. The Germans endeavor by their ingenuity to dull the alertness of the Red Army sappers. To counteract their deception, it is necessary to refrain from doing the obvious and guard against well-prepared traps.

For instance, mines sometimes are wired in series and, if the sapper does not investigate after disarming the first mine, he will be blown to bits



SKETCH A--RUSSIAN MINE DETECTOR



SKETCH B--RUSSIAN MINE DETECTOR

by the second. Another trick common with the Germans is to plant tin cans, so that the Soviet sappers will either become careless or have their attention diverted from the live mines. The enemy also suspends mines from trees or sticks, particularly at night, for use against tanks or personnel.

INFANTRY (TACTICAL)

16. JAPANESE TACTICS IN THE PHILIPPINES

The following comments and lessons on Japanese tactics and equipment have been gathered in interviews with officers who served with Filipino and American troops during the campaign in Luzon. They do not represent a complete survey of Japanese tactics and equipment, but are rather the observations of individual officers on what they saw and what impressed them.

The Japanese soldiers were fairly young, their average age being about 22 to 23, although the best troops were about 25, many of whom had had experience in China.

The Japanese have troops trained primarily for beach landing. Specially built barges drawn by motor boats carry 80 or more men. Landings were usually made at night; when possible, during a full moon. Ordinarily, the landings were made about midnight, with the barges coming as far in on the beach as possible.

Although the Japanese have specially trained landing troops they did not not always employ them, particularly when they knew the opposition would not be strong. Whenever the Japanese did encounter strong resistance in an attempted landing, they simply moved to another location and landed where the enemy was not present. After landing, they would attempt to push inland and encircle the troops along the shore.

No Japanese parachute troops were employed in the Philippines. The Japanese did, however, utilize parachutes in dropping bales of propaganda and in dropping food and ammunition to troops who had been isolated from their main forces.

As in every other campaign in the Far East, the principal tactics used by the Japanese centered on their ability to infiltrate. The actual infiltrations were usually carried out at night. The Japanese would work their way forward in small parties through gaps, around flanks, and even through the front lines. They would remain quiet during the following day, and on the next night more troops would infiltrate the American position until there was a sufficiently strong force actually in or behind the American lines to launch a small attack. In these infiltration tactics the Japanese were capitalizing on the initiative and "fanaticism" of the individual soldier.

American officers seem to agree that this "fanaticism" manifests itself particularly in lack of fear of death. As one officer puts it, "they will do things that they know will cost them their lives; for example, throw themselves on wire so that the following troops may pass over their bodies, or destroy tank mines by deliberately walking on them." In actual battle they are ferocious fighters. They very rarely surrender, because they fear what their captors will do to them and because they believe that if they die they go to Heaven and their families are honored. They also believe that if they surrender and are later retaken by their own troops, their families will be disgraced and they themselves will be punished. Even when surrounded, individual groups and soldiers will continue to fight on. One occasion has been reported when U.S. forces surrounded about 2,000 Japanese behind the American lines; about 200 got away, but the rest fought so savagely, refusing to surrender, that only about 50 were left to be captured. Many Japanese will even go so far as to commit suicide rather than be taken prisoner.

Another instance of the excellent fighting qualities of the individual Japanese soldier was illustrated in the extensive use of snipers. Apparently the members of the sniper corps were a picked group, for their marksmanship was extremely good, and they had been provided with special clothing. The footwear of the sniper was a split-toe, rubber-soled sneaker with a cloth top. He wore a head net over a steel helmet; and a loose shirt or smock of green and white replaced the usual uniform. Green sprigs and leaves were inserted in the head net over his helmet. Climbing a tree, the sniper would hide in the foliage after tying himself to the tree with vines or rope. There he would wait patiently for a suitable target. These snipers apparently had instructions to concentrate on the American officers, for often they would let a whole detachment of Filipino or American enlisted men go by in order to wait for a shot at an officer. The snipers employed the regular .25 caliber rifle of the ground troops, using powder which gave no flash, no smoke, and "a report not much louder than that of a B-B gun."

Characteristic of Japanese tactics was the attack at dusk. Infiltrating and moving around to the flanks, they would take as much territory as possible before actual darkness fell. During the night, positions would be consolidated so that by dawn they would have their recently occupied ground well organized against possible U.S. counterattacks. At all times the Japanese kept up a pressure against our lines, constantly seeking gaps and weak spots. When one was found, a small group would go in as far as possible, to be followed by more unless the first were immediately wiped out.

The Japanese had a novel method of serving their light machine gun. One man served as the mount, the second man was gunner. They would both drop to the ground and as soon as they had finished a clip, they would roll over, crawl away about 10 or more yards and then open up on the same targets. This had the effect of confusing the American and Filipino troops as to the exact position of the enemy, sometimes leading them to believe that there were two or more machine guns operating against them. The gun used was not a tommy gun, as many thought, but simply the Nambu light .25 caliber machine gun.

The Japanese artillery employed a fifth gun in many batteries. While the battery was firing, the fifth gun would range and obtain data for new targets, and after the four guns of the firing battery had accomplished their first mission they could then shift to the new target without delay. The Japanese handled their artillery well, except that in the beginning of the campaign their disposition of guns and batteries showed that they had not had much experience against an enemy who also used artillery. For example, initially there was very little attempt to conceal or camouflage the Japanese guns. After their artillery had been subjected to severe concentrations by the U.S. artillery, however, they learned quickly. Another mistake made at first was bringing up truck columns under U.S. artillery fire or attempting to occupy towns which were well within our artillery range, but the heavy casualties suffered soon taught them the value of camouflage and dispersion. The Japanese artillery fire was ordinarily accurate. They used the 105-mm. and 150-mm. guns, both of which were excellent. The range of the 105 is approximately 20,000 yards, that of the 150, 27,000 yards. The few 240-mm. pieces were not extensively used.

At first Japanese counterbattery fire was not good. There were probably two reasons for this: first, as already stated, the Japanese had never before been up against an enemy who had much artillery, that is, enough to make real counterbattery worth while; second, the U.S. counterbattery fire was so excellent that it more or less neutralized the Japanese artillery. At the end, however, when they were bombarding Corregidor, their counterbattery fire was very good.

Another characteristic of the Japanese was the apparent importance they attached to harassing tactics, with the object of creating confusion and indecision in the minds of their enemy. In these operations, which they kept up constantly, they utilized individuals and small groups to fire from unexpected positions, conduct sniping operations, and demonstrate in unexpected places. As reported in the newspapers, they would often use firecrackers to achieve this confusion. Bunches of firecrackers were set off at different positions in front of the U.S. lines, on their flanks, and even behind the lines. In so doing, they hoped to confuse U.S. troops as to the actual Japanese position, and also to draw U.S. fire and thus locate machine-gun and rifle groups. These tactics were effective against raw troops, but their effect decreased soon after soldiers had been exposed to them.

The Japanese had almost complete control of the air, and they utilized it to observe, bomb, and strafe the U.S. and Filipino troops. Most of the bombing was high-level; dive bombing was used occasionally but only against front-line troops. Against rear-area installations high-level attacks were always used. Ordinarily these high-level attacks were kept up to about 20,000 or 30,000 feet by U.S. antiaircraft.

Reports varied on the effectiveness of the Japanese Fifth Column activity. Apparently the Japanese attempted to use Fifth Column rather extensively but had only fair results. Some fires were lit on the beaches and in jungles, and some signals given with flares and flashlights. Many of the flares were

lighted by the Japanese themselves with the object of creating confusion among the U.S. troops.

The Japanese also used propaganda directed against both the Army and the civilians. How effective it was is not yet known, but the significant thing is that they did seriously try to use it, and may be expected to use it every time they feel there is any chance of obtaining results.

From Japanese activities in the Philippine campaign it is apparent that they will attempt, whenever possible, to tap wires and intercept radio messages. U.S. officers who fought in the Philippines emphasize that all conversations should be in code. There should be no reference to numerical designations or to individuals.

The Japanese also attempted to capitalize on the large number of refugees, driving them into the U.S. lines, thus adding to our burden of supply. It is reported that between 10,000 and 30,000 refugees flooded Bataan.

One officer gives the following comment as the most important generalization to be made on the Japanese soldier: "The Japanese are crafty, shrewd, given to deception. They are amazingly patient and wait hours, even days, for their chance. They are tough individual soldiers and work well in small groups of two or three men."

Another officer gives the following observation: "Don't underestimate the Jap. He is patient, an individualist, taught to go by himself. He does not fear capture when he gets behind your line. Guard your headquarters. He works at night. He is full of trickery; he knows English, will learn your name, call to you, get you off your guard, and kill you. He is a past master at using devices to annoy you and work on your morale even though these devices may have little other material effect. He doesn't surrender and in battle is a savage fighter."

MECHANIZED VEHICLES (TECHNICAL)

17. GERMAN TANKS FOR USE AS AMPHIBIANS.

The German army, during 1940 and 1941, stressed interest in a smooth and steadily increased rate of tank production. Immediately after the occupation of Czechoslovakia, the decision was taken to continue production of the light tank Panzerkampfwagen 38/T, manufactured by the C.K.D. (Ceskomoravska Kolben-Danek) metal-works factory in Prague.

In projecting the possibilities for future use of the 38/T tank (German military marking PzKw 38/T) for amphibian operation, certain new improvements over the older model were to be incorporated into the later type. For example, the Prague manufacturers were told that these tanks must be made waterproof, and provision made for mounting the tank on a floating device to enable the vehicle to surmount waves as high as 13 feet. The maximum seagoing speed was to be 8 miles per hour at least and the tank must be capable of running at this speed for 10 hours. Furthermore, it was to be required that, even while navigating the gun (in a revolving turret) should be able to fire.

Ability to climb twenty-degree beach slopes was another specification to be met. There was also the question of finding a way to discard the floating mechanism upon reaching land so that the crew need not dismount. The floating device was to consist of two floats made of balsa wood. The drive afloat was to be provided by two propellers driven by the tank motor through the medium of the track drive sprocket.

A prototype of this amphibian tank, delivered in January 1941, had the following characteristics:

Weight	5.5 tons (approx.)
Maximum land speed	25-30 m.p.h.
Speed in still water	7-9 m.p.h.
Angle of climb (land)	45° slope.
Angle of climb (beach)	30° slope.
Crossing ditch	5 ft. 4 in. wide, 60°- 80° slope on far side.
Armor thickness	0.3 - 0.6 in.
Armament	one 7.92-mm. m.g. in revolving turret.
Power	one 4-cylinder Flatwine motor 135 h.p., rear drive.

There have also been reports that the Germans have been experimenting with a tank capable of crossing the bed of a river. One version is that rubber covers for the turret and guns are fitted for water-tightness, air is supplied to the engine from oxygen bottles, and the crew is provided with oxygen breathing apparatus.

Another version is that the tanks, while under water, obtain their air supply through inlet and outlet tubes connected to a float which is towed by the tank.

Both these methods may be practicable for short river crossings. To travel long distances under water the problem might be solved as in a submarine, but practical difficulties of construction would be considerable if the tanks were required to withstand pressure at more than moderate depths. Also, batteries necessary for long under-water endurance would be very cumbersome and heavy.

18. ITALIAN TANK MODIFICATIONS

Recent reports show that there have been changes in the Italian tank M.13/40. The modified version is known as M.14/41. The armor has been reinforced by additional plates, the basic armor remaining the same. In consequence of these modifications the weight is now reported to be 1 ton heavier, i.e. 14 tons. The engine of the M.14/41 is said to be 145 h.p.

It is possible that there is another new model, the M.16, but the only information available at present is that unlike the earlier models it uses a gasoline engine.

MEDICAL

19. NOTES ON THE BURMA CAMPAIGN

The following observations are based on the campaign in Burma. Aside from such interest as they may have for the Medical Corps, they may also be of value to other branches of the service.

The difficulties of transporting patients from hospitals, and arranging for transportation and accommodation in areas other than those of the actual battle zone, require unusual staying power and courage on the part of those responsible. Retreats present an especially difficult problem for the medical services.

In the case of Burma, it was pointed out that units must have organic transport; pooled transport can never be spared for "medical" at really urgent periods, and some form of unit transport appears to be essential.

The value of nursing service personnel in all medical units needs no special emphasis. It was found that lack of trained nursing orderlies in the Indian and Burma Hospital Corps made it necessary to secure the services of all the available sisters, nurses, and volunteer ambulance drivers and place them in every non-divisional unit. The results here were most beneficial.

 [redacted]

One particular point brought out in the report was the real usefulness of motor training for all higher medical personnel. Time and again the need was apparent that all officers and higher medical personnel should be trained, not only to drive motor vehicles, but to repair and service them as and when required. In the early stages, ambulances were lost because the drivers left with the keys and no one present knew how to connect the wiring. In the later stages, those units always managed best that had real mechanics among their officers or higher non-commissioned officers.

There was a tendency to label every severe illness "cholera" when this disease was about, and to neglect cerebral malaria or acute dysentery in the diagnosis.

In the last two weeks of the Burma Campaign malaria was making itself evident. It was roughly estimated that 85 per cent of the men would eventually show infections.

The following general points are worth noting:

In an episode such as the Burma situation, a clear demonstration was given of the fact that all personnel of all units must be fit physically and mentally and must keep fit by marching and exercise. Many officers, particularly service and departmental officers, overlooked the obvious fact that it is part of their duty to maintain their own physical fitness and that of the personnel under their charge, no matter what their age or job. It is in emergencies such as this retreat that the unfit show up so markedly.

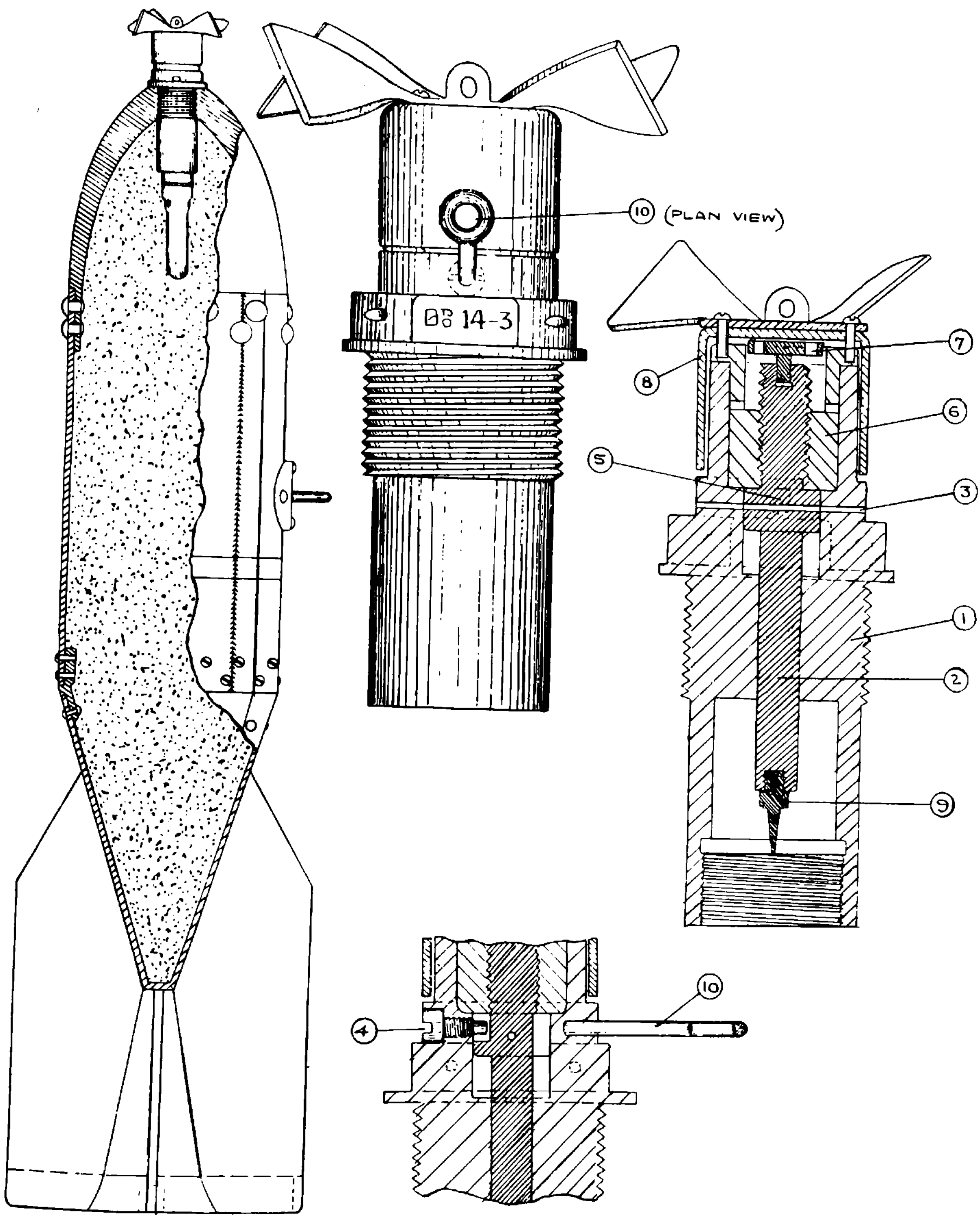
The modern habits of cocktail-drinking, bar-lounging, and chain-smoking, cannot be said to lend themselves to physical and mental fitness. Even the so-called sedentary work of office or hospital requires physical fitness since the job may well entail 10 to 12 or even 14 hours per day.

Because of individual cases where age seemed to have its effect on personnel unable to "take it", the need was stressed for the requirement of a rigid examination of older officers. Time and again, says the report, "we were affected by elderly officers and other ranks cracking up at awkward times; not only medical but personnel of all branches".

ORDNANCE (TECHNICAL)

20. JAPANESE SIXTY-KILOGRAM HIGH EXPLOSIVE BOMB (TYPE 97)

This bomb is reported to have been used extensively by the Japanese in the Malayan campaign (see accompanying diagram).



JAPANESE SIXTY KILOGRAM HIGH EXPLOSIVE BOMB (TYPE 97)

 [redacted]

The Bomb.

The bomb consists of a steel nose secured by twenty 10-mm. (0.4 in.) rivets to a steel body, at the other end of which is attached a tail assembly with four fins. The body and tail assembly are connected by a steel ring riveted to the tail cone by twenty-four 5-mm. (0.2 in.) rivets and screwed to the body by twenty-eight 5-mm. screws. The casing is identical with that of the 50-kg. incendiary bomb. The type-97 fuse is used in the nose.

The Fuse.

(a) Description. The body (1) carries the striker spindle (2) which is held in place by a thin shear wire (3) and by a grub screw (4) which engages in a slot (5) in the spindle. The upper portion of the spindle carries a left-hand thread which screws into a pressure block (6). At the top of the striker spindle is a small screw (7) with a right-hand thread and large head; the function of this screw is to prevent the pressure block (6) from unscrewing completely. The pressure block carries a brass cap (8) with four galvanized iron vanes, the cap being attached to the block by four small screws. A small steel striker (9) is screwed into the bottom of the striker spindle.

(b) Method of functioning. Before the bomb is released the cap and pressure block are screwed firmly down on the striker spindle. The screw (7) bears tightly against the inside of the cap (8) and this prevents the threads on the striker spindle (2) and the pressure block (6) from jamming. The pressure block rests on the shoulder of the main body (1). On release of the bomb from the aircraft, the wire is withdrawn from two loops in the center of the vanes and from the safety wire loop (10). The remaining vanes rotate in a clockwise direction, so that the pressure block and cap are raised off the shoulder of the body (1), the striker (2) being still prevented from moving by the shear wire (3). The vanes are prevented from coming off completely by the screw (7) the thread of which is right-hand and cannot be rotated by the pressure block (6). On impact the cap-pressure block-striker system is forced down, breaking the shear wire; and the detonator functions. The maximum number of rotations of the cap-pressure block system is 5 3/4, the pitch being 3 mm. (0.12 in.), and the striker is approximately 4 mm. (0.16 in.) from the cap. Just over one turn is therefore sufficient to fire the fuse. The body (1) has an internal thread at its lower end, into which a brass gaine or magazine can be screwed.

21. ITALIAN SELF-PROPELLED GUN-HOWITZER 75/18

It has been reported that the 75/18 (caliber 75 mm., length of bore 18 calibers) gun-howitzer is mounted on a turretless M.13/40 tank chassis. The equipment is known as "Semovente" artillery. The report does not state whether it is the model 1934 or model 1935 of the 75/18 that is employed. However, the two models have identical performances, the only difference being in the carriage. Particulars of the gun are as follows:

Length of bore	18 cals.
Muzzle of velocity	1,430 f.s.
Weight of shell	13.9 lbs.
Maximum range	10,300 yards
Maximum elevation	65° (model 34) 45° (model 35)
Maximum depression	10°
Maximum traverse	50°
Weight in action	1,760 lbs. (model 34) 1.1 tons (model 35)

The M.13/40 tank has so far proved to be the best of the Italian tanks and it seems more probable that the less satisfactory M.11/39 would be converted. The chassis of the two tanks are very similar.

SIGNAL CORPS (TACTICAL)

22. GERMAN SIGNAL UNITS

In the German Army a tactical army is served by one motorized signal regiment. Corps, infantry divisions, motorized infantry divisions, mountain divisions, armored corps, armored divisions, and "Landwehr" infantry divisions are all provided with a signal battalion, charged with laying and maintaining the signal communications of the unit. The light motorized brigade, the cavalry brigade, and each frontier guard sector have available one signal company. All of these signal units are fully motorized except those in the "Landwehr" infantry divisions, mountain divisions, and normal infantry divisions, which are only partly motorized.

The normal signal net of an army consists chiefly of open wire on poles. Multicircuit land cables are also used as far as the command posts of army corps. The army corps signal battalion establishes connections by single circuit cables to the command posts of the division. Divisional signal units hook into this army corps net and lay their own signal net, which extends as far as the regimental command post. Units smaller than the regiment lay wire to their next higher command posts, i.e., the battalion to the regimental C.P., and the company or battery to the battalion C.P.

This wire net is supplemented by radio communications wherever the wire may be subjected to severe bombardment, or in mobile situations where it is impossible to maintain communication by wire. Ground-air communications are, of course, also carried on by radio.

The Germans strive for the utmost security in the use of radio. They attempt to limit radio messages to subjects which contain no secret information.

Walkie-talkies, "Tornisterfunktruppe", are extensively used, in the front line units as well as in higher echelons. Messenger dogs, carrier pigeons, and rockets (visual or sound) are used to supplement the two basic methods of radio and wire.

The Germans emphasize that for the signal unit to function effectively, its officers must have a thorough understanding of the tactics of the units which they serve. This is typical of all cooperating arms and services of the German armed forces in the emphasis placed on achieving cooperation by mutual understanding of the problems and characteristics of the supported arm.

A highly developed branch of the German signal units is the radio-listening service, "Funkaufklarung". While this unit concentrates primarily on enemy radio messages, it also attempts to tap wire messages. The effectiveness of its interception has been illustrated in documents captured from a radio-listening company operating with the German Afrika Korps in North Africa. These captured documents indicated the thorough and methodical compilation which the Germans had made of all the references to units, officers, positions, equipment, strength, and even personal messages. With this information they were able to interpret many of the code names used by the British for units and officers. It is, perhaps, because of the efficiency of their own radio-listening service that they place such stress on radio security within their own units, assuming that the enemy is as well qualified as they to capitalize on carelessness.

The "bearing-taking" service, "Peilen", is also a part of the signal units and is charged with locating enemy planes by the use of radio direction finding.

In each division there is a divisional Signal Officer who advises the commander in all problems of signal communication and even goes so far as to influence the location of the command posts. The message center itself is located with due consideration for ground and air visibility, defilade against direct fire, conditions of approach, distance from the divisional command post, etc.

In the divisional message center the standing operating procedure requires that the sender be notified if ordinary messages have not been sent in 30 minutes, or if urgent messages have not been sent in 20 minutes. In the front lines a blanket maximum sending time of 20 minutes is prescribed.

 [redacted]

GLOSSARY

SOME OF THE MORE IMPORTANT BRITISH ABBREVIATIONS

ABBREVIATION	MEANING
AAD	Antiaircraft Defense
AC (Sqn)	Armored Car, or Army Co-operation (Squadron)
ACV	Armored Command Vehicle
ADS	Advanced Dressing Station
Adv Gd	Advanced Guard
AFV	Armored Fighting Vehicles
AI	Aircraft Interception (airborne)
ALC	Assault Landing Craft
ALG	Advanced Landing Ground
Amn	Ammunition
APP	Armor Piercing Projectile
ARH	Ammunition Railhead
ARP	Ammunition Refilling Point
AP	Armor Piercing, or Ammunition Point
AT or A/TK	Antitank
BAC	Brigade Ammunition Column
Bde	Brigade
BLR	Beyond Light Repair
BM	Bomb
Bndy	Boundary
BOD	Base Ordnance Depot
BOP	Battery Observation Post
BOW	Base Ordnance Workshop
Bty	Battery
CAP	Company Aid Post
Cart	Cartridges
CCS	Casualty Clearing Station
Cl Sp Tp	Close Support Troop
Coln	Column
Coy	Company
CRS	Corps Rest Station
CT	Communication Trench, or Corps Troops
DAC	Divisional Ammunition Column
DF	Direction Finding (by radio), or Defensive Fires
Dis. Pt	Dispersal Point
DP	Delivery Point, or Dispersal Point
DRS	Divisional Rest Station
Ech	Echelon
Eqpt	Equipment
Flt	Flight

ABBREVIATION	MEANING
FRT	Fortress
FT	Flame Thrower
GF	Gun Fire
Gr	Gunner
Gren	Grenades
HEAP	Armor Piercing (filled with H.E.)
HEDA	H.E. Delayed Action Fuse
HETIM & HETF	H.E. Time Fuse
INC	Incendiary
LAD	Light Aid Detachment (vehicle maintenance)
LRS	Light Repair Section
LMG	Light Machine Gun
MDS	Main Dressing Station
mih	Miles in the hour (speed)
ML	Motor Launch
MT	Motor Transport
Pdr or PR	Pounder
Ph R	Photographic Reconnaissance
POL	Petrol, Oil and Lubricants
Pte	Private
RAP	Regimental Aid Post
Recce	Reconnaissance
Rfn	Rifleman
RH	Railhead
RP	Refilling Point, or Rules of Procedure
rpgpm	Rounds per gun per minute
RV	Rendezvous
Sp	Support
Spr	Sapper
Tp	Troop
Tpt	Transportation, or Transport
Veh	Vehicle
V/T	Visual Telegraphy
vtm	Vehicles to the mile (road density)
WT	Wireless Telegraphy
X rds	Cross Roads

SECTION II

FINNISH TACTICS--SMALL UNITS

FINNISH TACTICS -- SMALL UNITS

Introduction.

The tactical doctrine of the Finnish Army presupposes an overwhelming superiority in numbers and materiel on the part of its potential enemy. To increase the effectiveness of their defense against such an enemy, Finnish tactics take advantage of the available natural factors: the characteristics of the Finnish people, and the nature and possibilities of Finland's terrain.

Their long struggle with poor soil caused the Finnish people to develop exceptional physical strength, iron nerves, resourcefulness, and a stubborn will. These traits, together with the high level of popular education, general skill in arms, the expert use of skis, and familiarity with life in the woods make the Finnish soldier especially suited for independent action.

The Finns are naturally uncommunicative, like to go their own way, and are of a suspicious nature. Not easily aroused to enthusiasm, they are strong-willed, and once an idea is conceived it is held tenaciously. Finns are hard to lead, but, once having accepted a leader, are extremely loyal.

The country is largely covered with woods, thousands of lakes, and numerous rivers and swamps. The coastline is very irregular. Travel must be confined to roads since crosscountry communication is almost impossible. The roads are many miles apart and hemmed in by the forest. The clearings for agricultural purposes are few and small. It is a rolling country, with very few marked elevations.

Finns realized long ago that if war came to them, it would be a defensive conflict begun by an aggressor and fought from the very first day within their own boundaries. The general plan of defense assumes that the enemy will be unprepared by nature and experience to cope with conditions in Finland.

General.

Although Finnish troops are organized into divisions, brigades, regiments, etc., in the same manner as other modern armies, their operations against an enemy emphasize use of small units: patrols, attacking groups, and detachments.

The basic tactical doctrine assumes that the enemy will follow avenues of approach which will make him vulnerable to encirclement, after which his forces are to be destroyed piecemeal. This is accomplished by forcing the enemy to follow routes outlined by either natural or artificial obstacles until he reaches the terrain selected for his annihilation.

The tactics of annihilation are carried out through the use of a "motti". In original usage the word motti means a pile of sawn timber held in position by upright stakes driven in at intervals along its edges. In military usage, motti refers to an enemy group surrounded by Finnish patrols each of from eight to twelve men armed with automatic arms. Lines of communication are severed and the surrounded enemy is decimated by numerous raids, severe cold, and slow

starvation. This encirclement may last several months, until the enemy force is completely destroyed.

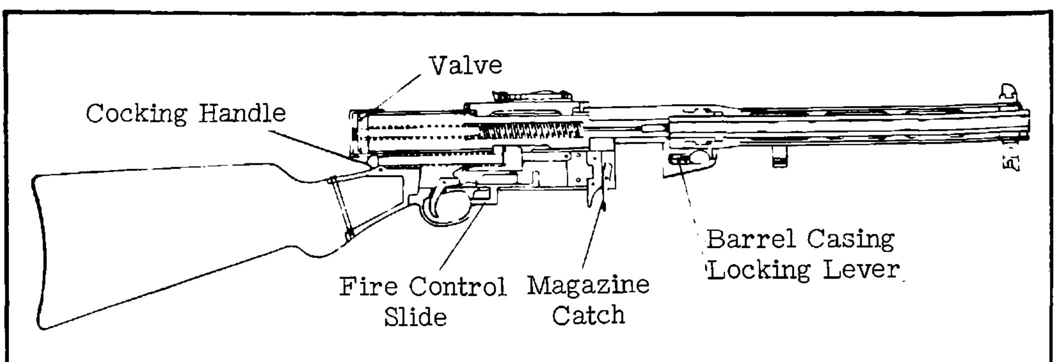
A modern army invading Finland is to a large extent confined to the roads in order to move its mechanized units and weapons forward. Finnish light artillery is so emplaced as to force these moving columns off the road into the adjacent forests. The Finns then rush their machine guns and antitank guns through the forest on a special type of sled called a "pulka"; they attack and are off again before the enemy can take any counteraction.

Finnish winter uniforms are made of white skins and furs, and patrols wear a white cape with a hood attached. Against a snow-covered background they are almost invisible to the enemy. Materiel is also camouflaged to blend with the white background. For example, the Finns cover captured tanks with lime-wash to make them less conspicuous.

No Finnish unit, however small, is ever sent out upon operations of more than a few hours' length without heating equipment adapted to its needs. Dugouts are constructed, lined with skins and roofed with birch logs capable of supporting several feet of snow. In each of these shelters there is a stove designed to burn without sparks or visible trace of smoke.

The Finns are experts on skis and rely mainly on their use in winter; material is transported on motor trucks, horse-drawn sleighs, and dog-team sleds. Ski troops have been known to travel over 65 miles a day.

The chief offensive weapon of the Finns is the Suomi machine carbine, similar to our sub-machine gun (see sketch). Ordinary Central European

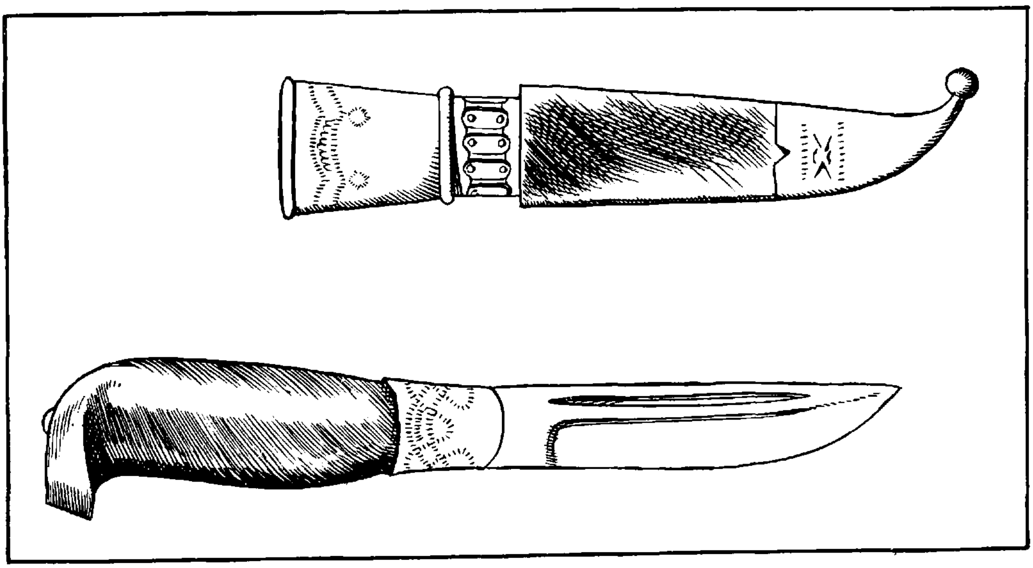


9-MM. MACHINE CARBINE--SUOMI

military tactics demands fire beginning at long ranges in the form of artillery preparation and increasing gradually in intensity over a considerable period of time. Something entirely different is required for warfare in the Finnish woods. Here the weapons must be located far forward and maximum fire power attained immediately. This demands an automatic weapon which is light and mobile. This weapon must be unusually well-balanced to ensure good aim under difficulties incident to forest fighting. The Suomi carbine is the weapon which fulfills all these requirements.

Long-range rifles are not suitable for forest warfare because of the very limited fields of fire.

In Finnish practice, the place of the bayonet is taken by the "puukko" (see sketch). The best puukko, or Finnish knife, comes from Lapland. It usually



FINNISH "PUUKKO"

has a straight blade 7 1/2 in. long, tapering to a point in the last 1 1/2 in. Its handle is 4 1/2 in. long and made of polished wood. It is generally enclosed in a scabbard of tooled leather. The puukko is a weapon for the silence and darkness of the woods. It is carried by most Finnish troops and particularly adapted to night raids.

Activities of Patrols.

Against massed troops and columns of the enemy, Finnish patrols employ fire from automatic weapons, trench mortars, and light artillery. However,

columns are annihilated chiefly by swift movement and automatic fire. For this purpose ski troops are held in readiness and are put into action at the proper time. These ski troops attack a column on the flank, move rapidly along the whole length, and inflict casualties with automatic weapons.

When decisive action is expected to take place in woods, machine guns, as a rule, are not taken along. These have little effect in woods and may easily fall into the hands of the enemy. On the other hand, the Finns recognize the fact that fire of lighter automatic weapons increases the momentum of attack in the woods and employ them in unusually large numbers.

The Finns do not attack large bodies of enemy troops. They devote their energies primarily to three specialized tasks: a) depriving the enemy divisions of their command by attacking and destroying regimental and brigade headquarters; b) concentrating on the destruction of the field-kitchens; and c) attacking communications.

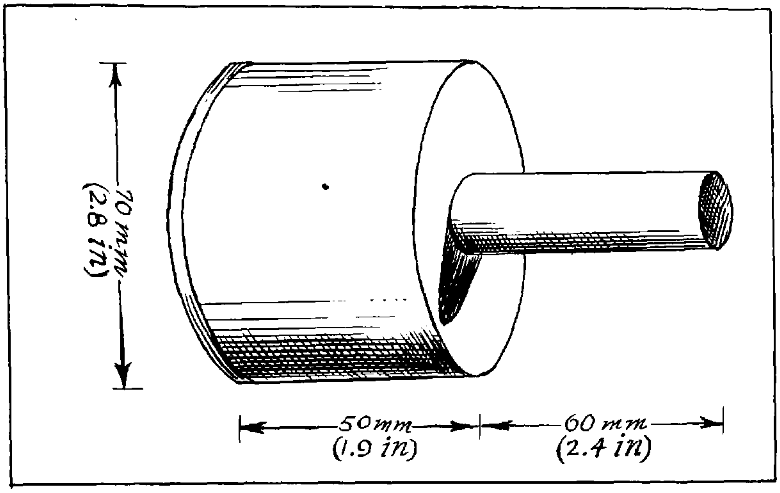
When the enemy lines of communication are extended, they are subjected to incessant harassing. For this purpose detachments of picked ski-runners are considered most suitable.

A condition for success of the raid is that such detachments receive clear, and very often detailed instructions. Orders to such detachments must therefore be issued by an experienced officer, either a battalion or regimental commander.

During very cold weather, night attacks yield better results against hostile troops if these have had to halt in the open for lack of suitable bivouacs. The mere fact that the activities of patrols and aircraft prevent the enemy from lighting fires causes many frostbites and severe colds, and makes him more vulnerable to attacks by major forces. Patrols are equipped with machine carbines, hand grenades, and materiel for destroying armored vehicles and for burning trains, supplies, etc.

In addition to inflicting direct casualties, patrol activity creates a feeling of uncertainty among enemy troops and forces them to take excessive measures of precaution. For example, as a result of such activity by Finnish patrols, the commander of a Russian tank corps ordered an entire tank brigade to reconnoiter the terrain far to the rear of the Russian positions.

For the destruction of armored vehicles, and for burning trains, Finnish patrols are provided with "partisan incendiary grenades" (see sketch). These contain about 300 grams of thermite. Arming is effected by striking the friction surface of a match box against the friction surface at the end of the handle. By means of a fuse card the thermite is ignited 5 or 6 seconds later.



FINNISH "PARTISAN INCENDIARY GRENADE"

Antitank Defense.

During the first Russo-Finnish War (1939) great losses were suffered by Russian tank units attempting to penetrate Finnish antitank defenses.

The first Russian attempt to attack with tanks was stopped and disorganized by fields of mines arranged inside the frontier. The mines were placed on all the roads, paths, and bridges, and caused severe losses among the tanks.

These mines were not placed in fixed positions. During the night Finnish patrols would replace destroyed mines, particularly on roads over which some Russian units had already passed. Many tanks were destroyed in this way.

In order to prevent the removal of mines by the enemy, mine fields are kept under constant observation and are covered by infantry fire.

The Finns construct tank obstacles of various types, and mine the weaker points in the lay-out of obstacles. One of these obstacles is an abatis. An abatis is at least 30 yards in depth and made of trees with trunks measuring over 8 inches in diameter. Trees are cut from 3 to 4 feet above the ground but left attached to their stumps. The tops are pointed toward the defender. The trees are attached to one another with steel wire, large nails, or hooks, and barbed wire is interlaced in all directions. With traps inside such barriers, their removal is rendered very difficult. The tops of these trees must not be parallel but should partly cross one another so as not to allow passage between the trunks.

Antitank defense companies are employed for destruction of tanks which may break through the main line of resistance. Such missions require alert and

aggressive men.

The antitank defense company consists of 3 platoons of 4 sections each; a section includes a leader, an assistant leader, 5 men, 3 men in reserve. The company is equipped with several cargo trucks for various types of mines and Molotov cocktails.

The company performs on the principle that observation from a tank is limited and that it cannot fire at an object within a radius of 3 to 4 yards. A section operates in the following manner:

Men are placed in pairs, one on each side of the road over a distance of 75 to 100 yards. Each man digs a shelter for himself and thoroughly camouflages it. Tanks, which generally drive along the road in platoons of 5 vehicles each, are allowed to advance to a point where the first tank is abreast of the last pair of men. Here it is destroyed by a mine drawn across the road in its path. This is usually a signal for the other pairs of men to take advantage of the resultant confusion and simultaneously destroy the other tanks. To accomplish the destruction of such a tank group, terrain is selected where it is difficult for the tanks to leave the road, as in dense woods or on stony ground.

A mine drawn across the road is constructed of four ordinary tank mines coupled together with wire, the distance between each mine being about 1 inch. A wire about 25 yards long is attached to each end of the series of mines, and by means of this wire they are drawn across the road. The parts of the wire lying on the road are camouflaged. Since the bottom of the mine is indented and does not slide easily, a plank or strip of tin must be placed underneath. As the tank approaches, the mines are drawn onto the road in front of it.

Stopping of the first tank in the column is the signal for a general attack. An antitank mine is thrown in front of the track of each tank and combustible bottles are thrown simultaneously. Immediately after the detonation of the antitank mine and the immobilization of the tank, a grenade thrower jumps or climbs onto the tank and throws a hand grenade through the roof shutter of the turret.

The audacity of antitank defense personnel can best be illustrated by reports of their action north of Lake Ladoga against Russian tanks. Lacking other tank-destroying equipment, Finnish soldiers were reported to have bent the barrels of the tank machine guns by hitting them with trunks of birch trees.

Antitank defense platoons cooperate with the antitank gun platoons whenever possible. When the latter hit a tank they signal the antitank defense personnel to destroy it.

Possessing very few antitank guns, the Finns became experts in the accurate delivery of fire, and strategic emplacement. They realized that antitank guns located on the main line of resistance are destroyed either by the fire of hostile tank guns or by being overrun by attacking tanks. Finnish tactics stress that antitank guns, when possible, should be located on reverse slopes, on ground

interspersed with boulders, under cover of terrain difficult to pass, or under protection of mines placed well forward. A frequent change of positions is also a method of avoiding destruction.

Antiaircraft Defense.

Their best defense against air attacks, and one utilized to great advantage by Finnish troops, is the natural cover and concealment afforded by local terrain. Thick forests and the excellent camouflage of troops and materiel make air observation very difficult.

In addition to the use of basic infantry weapons on enemy aircraft, the Finns employ the 76-mm., 40-mm., and 20-mm. antiaircraft guns and the 7.62-mm. antiaircraft machine gun. Of these, the 40-mm. antiaircraft gun proved to be the most efficient in the ratio of ammunition expended to the number of planes downed. Small-arms antiaircraft fire is delivered only by platoons.

It has been reported that during the Russo-Finnish War, the Finns found the use of Stokes mortars effective against dive-bombing attacks. The mortars were placed in batteries of four, under the command of an officer. The future position of the target was estimated by the gunners. Mortar shells were kept ready at charges 1, 2, and 3. The officer selected the charge and gave the initial order to fire. Although the number of planes brought down by this method was not great, the fire interfered with the aim of the bombers and kept them at a respectful distance. This expedient was originally improvised by infantry units which had no other means of antiaircraft defense.

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TACTICAL AND TECHNICAL TRENDS

No. 7
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SECTION I TACTICAL AND TECHNICAL TRENDS

To facilitate the obtaining of complete reports where excerpts only are presented in the bulletin, each item will be numbered consecutively. In referring to them, it is requested that you do so by number together with the date and number of the issue itself.

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SECTION I

TECHNICAL AND TACTICAL TRENDS

1. EMPLOYMENT OF GERMAN ANTIAIRCRAFT ARTILLERY AT SEVASTOPOL

The account given below describes an interesting example of the employment of antiaircraft guns in the battle for Sevastopol. This article appeared in the German press in the middle of June, and shows clearly that 88-mm antiaircraft guns have been used against ground targets by the German troops in Russia just as they have been by the Afrika Korps of Field Marshal Rommel.

"The battle for Sevastopol is among the hardest of the war. Here the German Command was confronted with a narrow front barricaded completely with concrete, steel, and guns. But however heavy the barrage from the massed Soviet artillery, our antiaircraft guns succeeded in pushing through on several occasions and knocking out pillboxes at very short ranges so that our infantry could advance again. The initiative of the antiaircraft gun crews in the battle for Sevastopol was outstanding, and one particular instance has been singled out as an example.

"A lieutenant in charge of an antiaircraft combat detachment, who had been especially prominent in the fighting on the northern sector of the Sevastopol front, was ordered to support the infantry attack with one heavy gun and a light antiaircraft section, firing from a gully. The tasks of these antiaircraft combat detachments are almost always extraordinarily difficult. While the field artillery remains stationary for long periods in each position, the guns of the antiaircraft combat groups move close behind the first wave of the infantry, and engage over open sights and at very short ranges those pillboxes and other enemy centers of resistance which the infantry cannot overcome. Since the antiaircraft groups move normally without cover, they tend to draw the fire of all the enemy artillery. Such was the case here--and, in addition, the Soviet defenders had registered every yard of the ground.

"At first the task seemed impossible to the lieutenant. There was no field of fire for his gun from the gully, and the violent fire of the defenders made it impossible to advance. All alternative routes to the enemy pillboxes were also under heavy fire.

"Thereupon the lieutenant decided on a bold gamble. Despite the intensive Soviet fire, he rushed his gun to a suitable position and opened fire immediately. By constant change of position and by taking cover momentarily when things became too hot, he was able to maintain an almost continuous rate of fire against his targets. In this way he succeeded in knocking out six pillboxes and, in conjunction with the light antiaircraft section, silenced a number of field works, machine-gun nests, and gun positions.

"Similar antiaircraft combat groups were employed on a number of other sectors. In practically every instance they are the first heavy weapons to follow the infantry. Although the way is first cleared for them by the engineers, it nevertheless requires skill and coolness to take the gun through the narrow gap in the minefields, where the slightest deviation may bring disaster. Furthermore the terrain at Sevastopol is extremely difficult. The long hillsides are covered with thick undergrowth and bushes, and bristle with pillboxes

and weapon-pits. Concealed Russian snipers will permit the antiaircraft elements to pass unmolested and then ambush the supporting units as they come up. The German infantry, following its own artillery screen on a front of a few hundred yards, is subjected to continuous Soviet attacks, supported by artillery, from the flank. In these circumstances the situation has often been saved solely by the initiative of the antiaircraft combat groups and by the high rate of fire of their guns."

COMMENT: The above account appears to indicate that the Germans, at any rate at Sevastopol, used antiaircraft guns to give close support to the infantry. The high velocity and heavy shell of the 88-mm antiaircraft gun make it a formidable weapon against pillboxes and similar types of concrete defenses. (See this publication No. 5, page 39, for the account of the siege of Sevastopol.)

ANTITANK (TACTICAL)

2. RUSSIAN EMPLOYMENT OF ANTIAIRCRAFT GUNS AGAINST TANKS

Like the Germans, the Russians have found that it is profitable to allot antiaircraft guns a secondary mission of antitank defense. The following comments on antitank employment of these guns are taken from a recent issue of the semiofficial "Red Star."

"In the Russo-German War the Red Army antiaircraft artillery has learned to combat tanks as well as planes. Dual-purpose antiaircraft guns make good antitank guns because of their high muzzle velocity, high rate of fire, and 360° traverse.

"In the first 6 months of the war, Red Army antiaircraft artillery fired in self-defense at enemy tanks which broke through to the battery positions. Gradually, however, the antiaircraft artillery became an organic part of the antitank defensive system. In numerous instances, Russian antiaircraft guns have successfully repulsed attacks of large tank units.

"The antiaircraft units learned that most tactical operations seem to divide themselves into two phases. In the first phase, Russian army artillery concentrates heavy fire on enemy tanks before they can jump off. It then lays down a screen of fire to prevent the enemy tanks from approaching the Russian forward line of defense and breaking up infantry formations. In this stage the antiaircraft units are busily engaged in repelling the attacks of enemy aircraft, particularly dive bombers, which attempt to open the way for the tanks.

"In the second phase, after German tanks have broken into the initial line of defense, or deeper, the German aviation generally shifts its attention to Russian units reserved for counterattack. In this comparative lull, antiaircraft guns fire at the German tanks by direct laying; the shorter the range, the more effective the fire.

"It must always be remembered, however, that the first mission of antiaircraft artillery is defense against planes. In areas where there is insufficient antitank artillery, antiaircraft guns must be employed to drive off tanks which approach the battery positions or threaten to break up the battle formations of Russian troops.

"In order to combat enemy mechanized forces successfully, the antiaircraft artillery must prepare its antitank defense in advance. When the guns go into position they must be ready to open fire against attacking tanks immediately. To establish such a system it is necessary to:

1) Make a complete study of the surrounding terrain, with particular regard to possible tank approaches;

2) Determine the sector of fire for each gun, including ranges to key reference points;

3) Build the minimum amount of field fortifications necessary;

4) Establish special antitank observation points.

"All antiaircraft personnel not working at the guns during a tank attack take up positions in the vicinity and use hand grenades, gasoline bottles, or small-arms armor-piercing bullets against the enemy tanks."

ANTITANK (TECHNICAL)

3. NEW GUERLICH-PRINCIPLE GERMAN ANTITANK GUN

A captured document dated January 1942 refers to the introduction of a new antitank gun, the 42-mm Pak 41.

Examination of ammunition recently captured in the Middle East shows that this is a tapered-bore gun, the barrel tapering from 42 mm. at the breech to 28 mm. at the muzzle. Both HE and AP are fired, as in the case of the earlier 28/20-mm antitank gun, Model 41.

In this new weapon, it is interesting to note that the Germans are persevering with the Guerlich principle of a tapered bore.

4. ORGANIZATION AND IDENTIFICATION OF GERMAN ARTILLERY UNITS

In the German Army, all artillery, apart from the relatively small divisional allotment, belongs to the GHQ pool (Heerestruppen). From this pool, units are allotted to army groups or armies according to the estimated needs. They may be suballotted, for shorter or longer periods, to divisions or corps, in both cases normally being placed under the immediate control of special artillery commanders and staffs, also provided from the GHQ pool.

With the exception of artillery commanders and staffs, and artillery observation units, no two artillery units, regardless of type, bear the same number. The following brief notes will indicate the possible variations in composition and allocation of artillery.

(a) Division Artillery --The division artillery regiment varies in composition according to the type and manner of employment of the division, as follows:

(1) Panzer divisions -- The artillery regiment consists of three battalions ("I" and "II" equipped with 105-mm gun-howitzers, and "III" with 150-mm howitzers). In some cases, III Battalion was previously an independent battalion in the GHQ pool, carrying a number in the series 401-450 or 601-650. Documents from the battalion files may therefore sometimes lead to an obsolete identification. In a task force, the artillery regiment may be reinforced by one or more units of GHQ artillery or other arms, such as army antiaircraft or smoke units.

(2) Motorized divisions --The artillery regiment is organized on the same lines as that in the Panzer division, and in a task force may be reinforced in the same manner.

(3) Light divisions --The organization of the artillery in the light division is believed to be still in the experimental stage, and cannot, therefore, be detailed as yet.

(4) Mountain divisions --The artillery regiment is organized in four battalions: I, II, and III equipped with 75-mm mountain howitzers, and IV with 105-mm mountain howitzers. In a task force, it may be reinforced from the GHQ pool.

(5) Infantry divisions -- The artillery regiment consists of four battalions: I, II, and III equipped with 105-mm gun-howitzers, and IV with 150-mm howitzers. Those infantry divisions, however, which formed part of Germany's peacetime army received their medium battalions, on mobilization, from the peacetime medium regiments, which consisted of the horse-drawn I Battalion and the motorized II Battalion. In most cases the motorized battalion and regimental headquarters were withdrawn to the GHQ artillery pool. The horse-drawn battalion was incorporated into the divisional light artillery regiment, but retained its original battalion and regimental numbers. In the 1st through 36th Infantry Divisions, the medium regiments were designated by a number equivalent to the sum of 36 plus the number

designating the division; in the 44th, 45th, and 46th Infantry Divisions the medium regiments were designated by a number one higher than that of the light artillery regiment. The number designating the light artillery regiment was the same as the number of the division in the 1st through 36th Infantry Divisions; in the 44th, 45th, and 46th divisions, however, the number did not so correspond. Thus, after mobilization the artillery regiment of the peacetime 33rd Infantry Division was the 33rd Artillery Regiment, consisting of three light battalions and one medium battalion, designated respectively "I, II, and III Battalions, 33rd Artillery Regiment," and "I Battalion, 69th (i.e., 33 plus 36) Artillery Regiment."

In a task force, the division artillery regiment may be reinforced from the GHQ pool.

(6) Infantry divisions in defensive sectors--A division responsible for the defense of a sector (e.g., on the Channel Coast) may have its artillery modified to suit the local conditions. For example, part of the division regiment may be transferred elsewhere, for service in the field; equally, one or more units of coast defense or railway artillery from theGHQ pool may be incorporated (for the period of their tour of duty in that sector) in the division. In such cases, the units concerned retain their original numbers, but come under the ban against display of division numbers. Their shoulder straps and vehicles, therefore, will no longer serve to identify the unit.

(b) Artillery commanders --When the division artillery regiment is not reinforced from the GHQ pool, its commander is known as Artillerieführer (Arfü); he is also the division artillery commander. Whenever GHQ artillery units are attached to the division--in effect, whenever it is attacking--the Arfü is sometimes subordinated to an artillery commander (Artilleriekommandeur, abbreviated Arko), whose small special staff is supplemented in action by the larger staff of the organic artillery regiment. An Arko may also be assigned to command an allotment of artillery to corps. In this case a GHQ artillery regimental staff and an artillery observation unit are regularly included in the allotment. The following grades in the chain of artillery command have been identified:

(1) At GHQ--The artillery general at GHQ (OKH/Gen. d.Art.) is the principal adviser on the employment of artillery, and units from the GHQ pool are probably allotted to army groups and armies on his recommendations.

(2) At army-group and army Hq --The artillery general at army-group or army Hq (Stoart--artillery staff officer), or in a coastal sector (General der Küstenartillerie), advises the commander on all artillery matters, and recommends the suballotment of GHQ artillery units to lower units.

(3) Within army group and army--It is believed that each army group has one senior artillery commander (Höherer Artilleriekommandeur, abbreviated Höh. Arko) and staff, available to exercise command

over GHQ artillery units operating in an area larger than that of a single army corps.

(4) Under corps--An Arko (with staff) acts as the equivalent of an artillery commander whenever necessary, but a corps which is not in action may merely have a relatively junior artillery staff officer (Stoart) at corps Hq.

(5) Under division--An Arko (with staff) acts as the equivalent of a division artillery officer when assigned to a division in action.

(6) The Höh. Arko staffs carry numbers in the series 301 and upwards; the Arko staffs carry numbers in two series, 1-44, and 101 and upwards. There is no apparent connection between one of these numbers and that of the unit with which the commander concerned is for the moment operating.

(c) GHQ artillery--The heading Artillerie covers, in addition to the special commanders and staffs detailed under (b) (3)-(5) above, the following organizations, all of which wear the distinctive red piping of the artillery:

(1) Artillery regimental staffs--These include the staffs of the peacetime division medium regiments (Nos. 37-72, 97, 99 and 115--it is not known if the whole series was ever filled), and special staffs formed on or after mobilization (carrying numbers above 500). Most of the latter are independent staffs, with no battalions carrying the same number. Apart from coast-defense staffs, all GHQ artillery regimental staffs are fully motorized.

(2) Battalion staffs--There are a number of independent battalion staffs, the function of which is to administer and control independent GHQ medium, heavy, or superheavy batteries (motorized or railway) or coast defense batteries.

(3) Battalions and batteries--These include light, medium, heavy, and superheavy units, and may be horse-drawn, motorized, tractor-drawn, self-propelled, railway, or fixed artillery. The numbers allotted to them have no necessary connection with their particular type, though certain groups of coast defense artillery batteries which are equipped with weapons of the same type carry adjacent numbers (e.g., 996-998, coast defense batteries equipped with French 155-mm guns). The motorized II Battalion of the peacetime medium regiment invariably consists of three four-gun batteries, but many of the battalions formed on or after mobilization may have three-gun batteries, and heavy or superheavy batteries may include two guns only, or even one.

(4) Armored assault artillery--Armored assault artillery battalions are assigned vacant numbers in the series 151-250, and independent armored assault artillery batteries carry numbers above 650.

The battalion consists of an unnumbered Hq (Stabsbatterie) and three four-gun batteries. It is equipped with the 75-mm assault gun (Sturmgeschütz) on a self-propelled mount (see Article No. 5, this issue).

(5) Artillery observation battalions--The artillery observation battalions (Beobachtungsabteilung) are part of the GHQ pool. However, an armored artillery observation battery (Pz. Boeb. Battr.) is normally organically assigned to the division artillery regiment of the Panzer division. These batteries carry numbers in the series 320-350, which have no apparent relation to the regiment to which the battery is assigned.

(d) Other units--During the course of a given operation, the artillery commander may control units other than artillery proper. They will be classified on organization charts under the following headings:

(1) Panzerjäger--Tank destroyer units are usually an independent command, but some units such as a battalion, company, or platoon of GHQ antitank troops may be found under an Arko.

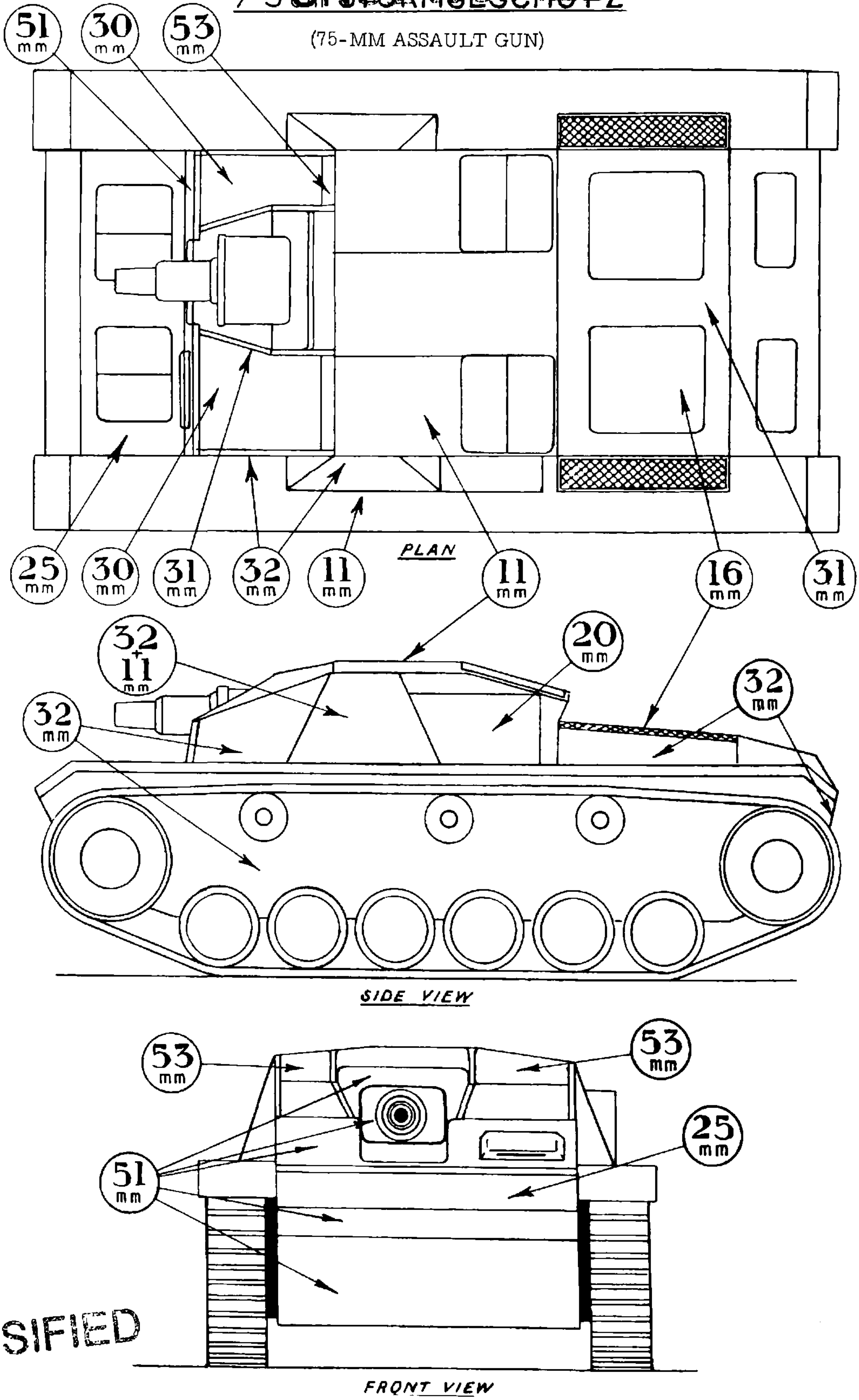
(2) Nebeltruppen--A regiment, or a regimental staff and one or more battalions of smoke troops, will regularly be found with a corps operating in the spearhead of an attack.

(3) Heeresflak--As a general term, Heeresflak designates: (a) Fla-Bataillone--antiaircraft battalions which belong to the infantry, and are therefore organically part of the ground forces and wear white piping; and (b) Heeresflakabteilungen--antiaircraft battalions which belong to the artillery and are therefore part of the ground forces and wear red piping. A Fla battalion or company, or a Heeresflak battery, may be under the command of the Arko.

(4) Luftwaffe --German air force antiaircraft units may provide additional antiaircraft reinforcement. It is Luftwaffe antiaircraft units which comprise the main German antiaircraft arm. Their total strength has been estimated at 1,000,000 men, whereas the Heeresflak units mentioned above consist of a relatively few independent battalions.

7·5 cm STURMGESCHÜTZ

(75-MM ASSAULT GUN)



5. GERMAN 75-mm ASSAULT GUN

This assault gun is a self-propelled gun mounted on a standard Mark III tank chassis. In 1940 a relatively small number took part in the Battle of France and it was first used extensively in the summer of 1941, when it played an important tactical role in the first battles on the Russian front.

The guns are organized into independent battalions, although it is now possible that they are organic within the motorized and Panzer divisions and are attached to front-line infantry divisions. Normally only direct fire is used.

An assault gun captured in the Middle East is described below.

The gun and mount weigh about 20 tons.

The gun itself is the short-barreled 75-mm tank gun originally mounted in the Mark IV tank. The range drum is graduated for HE up to 6,550 yards and for AP up to 1,640 yards. Elevation and traverse are hand-operated. Some other details are these:

Length of bore	23.5 cals.
Muzzle velocity (estimated)	1,600 f.s.
Elevation	20°
Depression	5°
Traverse	20°
Weight of projectiles	
HE	12 lb. 9 oz.
Smoke	13 lb. 9 oz.
AP (with ballistic cap)	13 lb. 9 oz.
AP (hollow charge)	not known
Estimated penetration of AP (with ballistic cap)	55 mm. (2.16 in.) at 60° at 400 yds.

It is believed that this low-velocity gun is being replaced by a high-velocity 75-mm gun with a reported length of bore of about 43 calibers. The Germans are also apparently making a similar change in the armament of the Mark IV Tank. (See this publication No. 4, page 15.)

As stated above, the hull is that of the standard German Mark III tank with normal suspension system. The turret has been removed. The length is 17 ft. 9 in., height 6 ft. 5 in., and width 9 ft. 7 in. In general the armor is 51 mm. (2 in.) at the front and 32 mm. (1.25 in.) on the sides and at the rear. An added 53-mm plate is fitted to the rear of the front vertical plate, apparently between the driving and fighting compartments, and is braced to the front plate by two 31-mm. plates, one on each side of the opening for the gun. For detailed arrangement of armor plate see accompanying sketch.

The sides of the hull are reported to be vulnerable to the British 40-mm antitank gun at 1,500 yards, but this gun can penetrate the front only at very short ranges, and even then only the driving compartment.

 [redacted]

The engine is a Maybach V-12-type rated at 300 horsepower. The gears provide for six speeds, and steering is hydraulically controlled. The capacity of the gasoline tank is 71 gallons, which is consumed at the rate of about 0.9 miles per gallon at a cruising speed of 22 miles per hour. The radius of action is about 70 miles, the maximum rate of speed about 29 miles per hour.

As in German tanks, this vehicle is equipped to carry extra gasoline in a rack on the rear of the vehicle, which should hold about 10 standard 5-gallon gasoline cans.

The captured vehicle contained metal boxes for 44 rounds of ammunition, and 40 rounds were stacked on the floor at the loader's station. Ammunition is also carried in an armored half-track which tows an armored ammunition trailer. There was also a rack for 12 stick grenades, and the usual smoke-candle release mechanism for 5 candles was fitted to the rear. For communication there were two radio receivers and one transmitter. For observation a scissors telescope was provided.

As spare parts the 11-mm. sloping plates over the track guard (see sketch) carried two spare bogie wheels on the right side and one on the left side. Two spare torsion rods were also carried, one in each side of the hull above the bogies.

The crew consists of four men -- a commander, gunner, loader, and driver.

CHEMICAL WARFARE (TECHNICAL)

6. JAPANESE TOXIC SMOKE CANDLES

Certain aspects of Japanese chemical warfare have been summarized in a recent report.

A Japanese manual dealing with operations in the Southwest Pacific specifically refers to the possibility of the use of gas by Britain, the United States, or the Netherlands. The intention of the Japanese may be to use this "possibility" as a justification for initiating the use of gas themselves.

Some Japanese gas masks with service containers have been recovered, and many notebooks have been captured in which the gas-mask number of each member of the unit has been recorded. Small containers holding a cleansing powder similar to British antigas ointments, and a pouch containing chloride of lime, have also been recovered. The cleansing powder is issued to each man, the chloride of lime to squads or larger units to be carried by the "antigas" NCO or private.

From this it will be seen that the Japanese are definitely prepared for

[redacted]

defense against gas. Their gas masks and other equipment are, of course, equally necessary if they are to use gas offensively.

The Japanese possess, and have provided the Burma traitor army with toxic smoke candles containing an arsenious compound which causes severe irritation to the nose and throat. It is not lethal and the effects pass off in 2 or 3 hours.

The Chinese have reported the use of "poison gas" in Burma. It is known that the toxic smoke candles mentioned above have been frequently used by the Japanese in China.

The Japanese toxic smoke candles described below were captured in Burma and presumably are the same as those containing an arsenious compound and mentioned above.

The candles are of two types, hand-thrown and charge-propelled.

(a) Hand-Thrown Type.

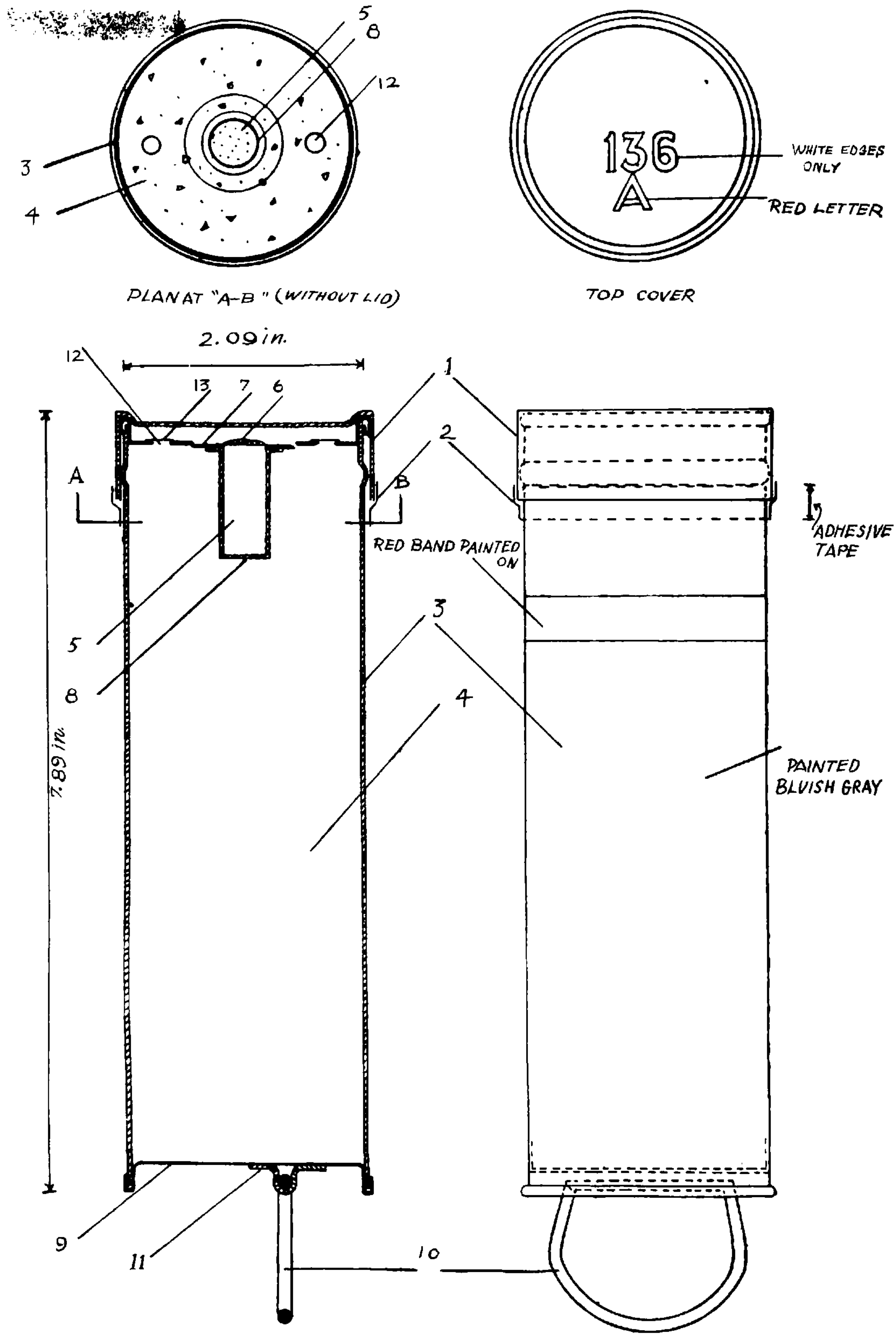
A preliminary examination shows that this candle contains a mixture of nitrocellulose, camphor, and diphenyl arsenic acid. The mixture is ignited by means of a matchhead and friction striker, and after a delay of 3 to 4 seconds the diphenyl arsenic acid is evolved in the form of a toxic smoke.

Diphenyl arsenic acid is a nose irritant about one-fourth as irritating as diphenylchlorarsine. As in the case of other toxic smokes, if the smoke is breathed before the mask is adjusted, the effects persist for some time after protection has been gained.

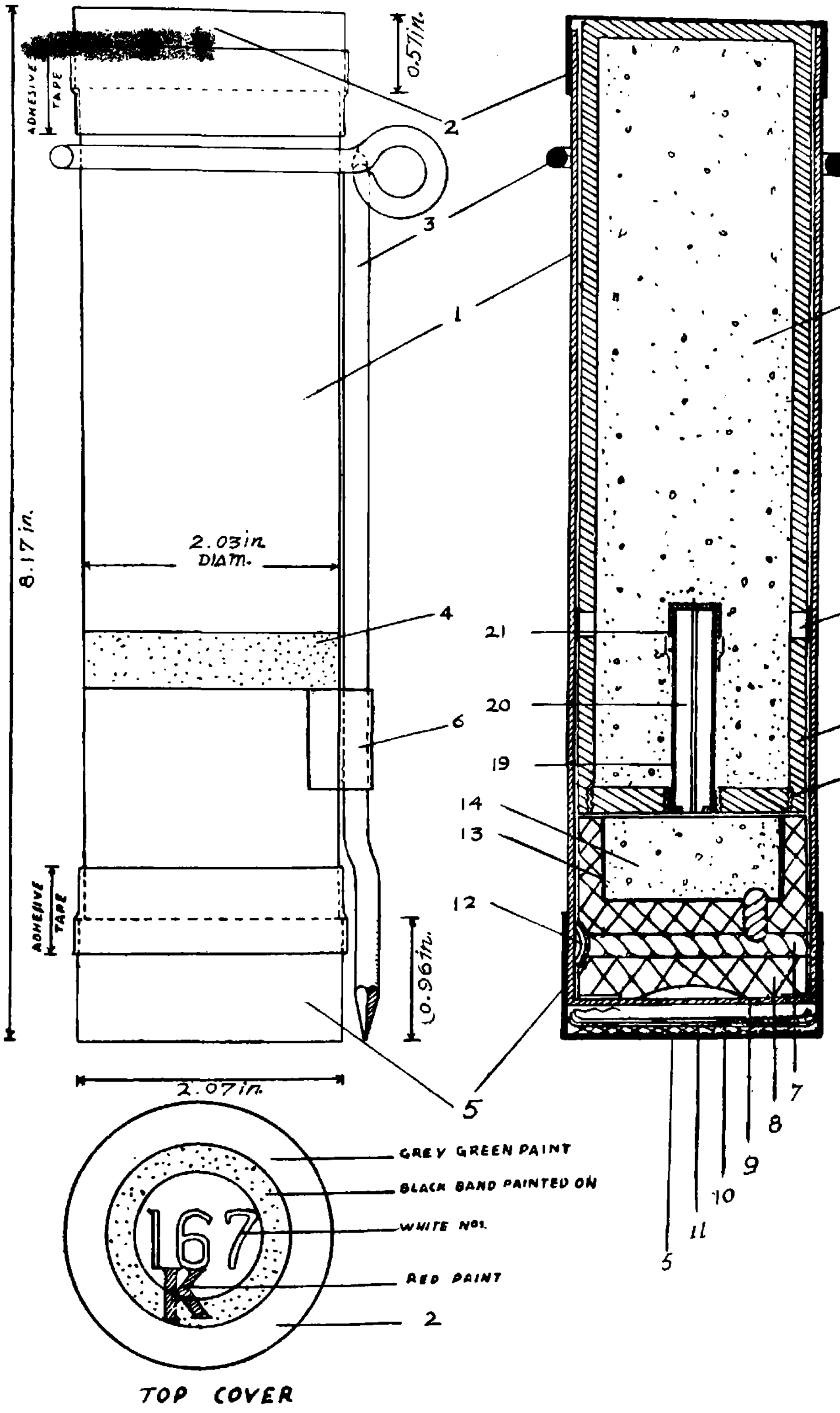
This type of candle is cylindrical in shape, about 7 inches long, and 2 inches in diameter. (See accompanying sketch and legend.) The weight is about 9 ounces. It is painted bluish gray with a red band, one-third of an inch wide, about 1 1/2 inches from the top.

Legend, hand-propelled type:

1. Lid with lettering "136A."
2. Adhesive sealing tape.
3. Cylindrical container, wall thickness 0.0124 in. Painted a bluish gray color.
4. Charge.
5. Fuze.
6. Ignition cap.
7. Tinplate diaphragm.
8. Leadfoil cover.
9. Bottom of container.
10. Handle, diameter 0.116 in.
11. Handle clip.
12. Smoke vent.
13. Tinfoil covering for vent.



JAPANESE SMOKE CANDLE--HAND-THROWN



JAPANESE SMOKE CANDLE--CHARGE-PROPELLED

(b) Charge-Propelled Type.

This candle is said to contain a composition similar to that in the hand-thrown candle.

It consists of an outer cylinder 8 inches long and 2 inches in diameter, and is painted a greenish gray color with a half-inch red band about 3 inches from the bottom. (See accompanying sketch and legend.) It contains a propelling charge, and an inner container which is the candle proper. The whole assembly is supported in an inclined position by means of an attached spike which is stuck into the ground.

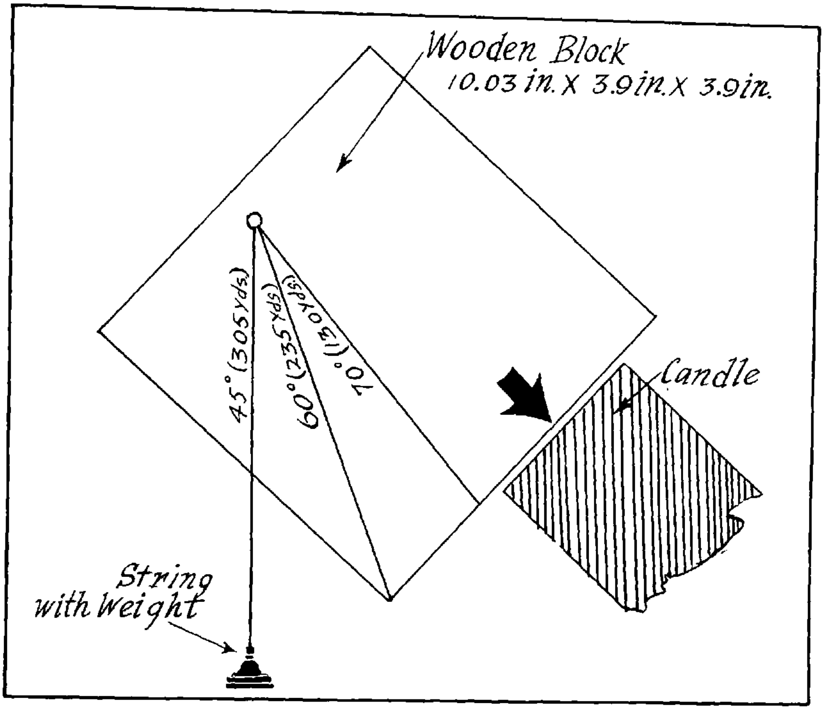
The propelling charge is ignited through a time fuze by means of a friction striker and matchhead. As the inner container is ejected, the flash of discharge ignites the smoke composition in this container through a fuze of 4 to 5 seconds delay.

Legend, charge-propelled type:

1. Outer container, wall thickness 1 mm. (0.039 in.). Painted a greenish gray color.
2. Top lid with lettering "167 K" sealed with adhesive tape.
3. Spike used to set up the candle.
4. Painted red band.
5. Bottom lid sealed with adhesive tape.
6. Clip securing spike to candle.
7. Fuze.
8. Wooden block drilled for fuze with positioning slot at bottom.
9. Bottom of outer container with slot at center for positioning wooden block..
10. Two cardboard packing disks.
11. Wooden disk with abrasive edging.
12. Ignition cap.
13. Cylindrical steel pan for powder propellant.
14. Propellant.
15. Screwed base of inner container.
16. Inner container, wall thickness about 2.5 mm. (0.098 in.).
17. Smoke vent.
18. Charge.
19. Fuze tube.
20. Fuze.
21. Lead cover.

See next page for sketch of device used for setting the charge-propelled smoke candle at the proper angle for the range desired.

ANGLE MEASURING BLOCK FOR USE WITH JAPANESE CHARGE-PROPELLED SMOKE CANDLE



ENGINEERS (TACTICAL)

7. GERMAN METHODS OF CAMOUFLAGE

Modern methods of air operations--including developments in aerial photography--have enormously increased the importance of camouflage.

In the last war the air was used more for reconnaissance than for bombing, and consequently troop movements were more important to conceal than factories and airdromes. It has needed the intense bombing attacks of this war to develop the art of concealing large structures such as railway stations and hangars.

The Germans have evidently studied the problem very closely, and with their usual thoroughness have resorted to elaborate schemes of concealment and deception wherever they consider such measures justified by the importance of the target. Thus it is now becoming the rule rather than the exception to see landing fields and airdromes presenting from the air the most convincing

impressions of woods, roads, ditches, hedges and cultivation patches. Brown, light green, and yellow substances are sprayed over the ground to give the effect of plough or vegetation. Dummy farms and other buildings are disposed around airdromes to conceal workshops or isolated aircraft outside their hangars, while papier-mache cows and beds of real flowers are used to add a convincing note. Dummy cottages are erected or painted on the tops of hangars, the vertical sides of which are sloped off by a lattice of steel wires garnished with green-dyed jute, sometimes shaped possibly to resemble trees. Great attention is always paid to changing the color of the garnishing by spraying so as to correspond with the changing colors of the seasons.

It is well known that Berlin has been extensively camouflaged, not only the city itself but also the outskirts. One example is the most important distinguishing landmark in Berlin, namely the wide avenue running east and west through the city and called the "Axis ". The pavement of this avenue has been sprayed with a dark green paint to blend with the trees in the Tiergarten (a large park), along the avenue and throughout the western section of the city. The Victory Monument (Siegesäule), in the center of a circle on the Axis, has been painted with a dull color so as not to reflect light. An overhead cover of wire matting, interwoven with green materials to resemble vegetation, covers the avenue for a considerable distance. The wire netting is about 18 feet high and is interspersed with artificial shrubs and trees. About every 30 yards the coloring and texture of the greenery has been changed. To eliminate shadows, netting has also been hung from the sides at an angle of about 20 degrees.

To create an opposite effect namely to simulate a street where in fact there is none, wire netting has also been used. These dummy streets are frequently connected with the real ones which then disappear into artificial woods. In one instance it is reported that a "woods" was created by fastening artificial sprigs about 1 foot high and about 1 to 2 inches apart to a wire net. Through these "woods" a system of "roads" was painted in brown on the mesh of the net.

In Berlin many important buildings have been camouflaged by covering them with nets, and by placing artificial barns, farm buildings, and trees on the roofs.

It has also been reported that dummy installations on a very large scale have been erected at a distance of about 40 kilometers from the center of Berlin in an area about 400 kilometers square. These dummies include not only structures simulating railway ststions, etc., but also installations to give the effect of city lights, and for causing fires to give the impression of effective bombing.

The principal railway station at Hamburg had a complete false roof built over it in the shape of a small hill. This false roof was completely covered with material resembling green grass, and artificial paths were made over the "hill". A hangar at Rheine in Northwest Germany had no other form of camouflage than two dark patches painted on top of the northern edge. These

patches combined with the shadow to break up the regular shape of hangar and shadow together. Painted disruptive camouflage of this type is very simple, and surprisingly effective when viewed under favorable lighting conditions.

Camouflage of a landing-field surface is begun at the earliest possible moment, even when extensive construction work is still going on. A good example of this is at Laval, south of Cherbourg, where the excellent camouflage of that area of the landing ground which is now finished could only have been carried out under considerable difficulty, in view of all the other levelling and drainage work involved.

Water is recognized as an easily distinguishable landmark, and lakes and canals in important industrial areas are covered by rafts and netting, painted to blend with the surroundings.

The importance of avoiding regular outline is appreciated, and applied not only to the breaking up of the form of large buildings, but also to the parking of motor transport.

Though considerable effort is apparently devoted to training the individual soldier to camouflage himself by the use of whatever material he may find, comparatively little information has come in concerning the methods adopted by German troops in European campaigns. There are two reasons for this: first, they have almost always been on the offensive, so that the necessity of constructing and concealing defensive positions has not arisen very frequently; and second, they have, at least until recently, enjoyed air superiority, so that the need of concealing themselves from air observation has hardly been felt.

Considerable ingenuity was shown in Poland and France in concealing minefields and artillery, but disruptive painting of motor transport and armored vehicles was apparently little practiced. The use of dummy positions appears to have been very common. Field guns were concealed in dummy haystacks, antitank guns and limbers were disguised as carts and even driven by soldiers disguised as civilians. On the other hand parachutes with straw dummies attached and canisters with bogus instructions were dropped to create alarm. There appears, in fact, to have been a frequent offensive use of camouflage to enable all kinds of ruses to be carried out.

German practice in Libya was affected by lack of unchallenged air superiority and by the fact that they have had to engage in positional warfare. Much ingenuity in concealing weapons, war materials, and minefields has been shown, aided very frequently by the favorite German method of using dummies.

In the desert more attention has had to be devoted to concealment from the air, which has been achieved in two ways. Either vehicles and war material are camouflaged with nets or local material, or else resort is had to wide dispersion. At first dispersion was bad owing to lack of training, but lessons have been quickly learned and dispersion is now generally excellent. The use of dummies is very frequent and popular.

In Section II of this publication, the report of the encirclement of Kiev mentions the use of this stratagem and its importance in the tactics adopted. Here, it is to be observed that dummies simulating boats and bridging equipment were constructed by the Germans in the crossing of the Dnieper in order to deceive the Russian observers as to the area chosen for the initial crossing.

Near Capuzzo in July 1941 guns were located among abandoned Italian artillery which had been left there from previous battles. These guns were not noticed until they opened fire. It is reported that at Derna planes destroyed in previous fighting had been recovered and placed on the airdrome as dummy targets. Dummy motor transport parks and coast defense guns had been constructed. A minefield was recently camouflaged by tracks made with a spare wheel between the mines, and a British armored car was lured into it. In an Italian sector a post was found manned with straw-filled dummies in German uniforms stripped from corpses.

Most important is the use of dummy tanks. According to a prisoner these are cardboard structures built over a motorcycle, but a photograph has been captured showing one mounted on a light Volkswagen. Probably both are used. They are, of course used only at a distance, and their purpose is to draw fire, to confuse the enemy as to the probable point of attack, to conceal the fact that a real tank unit has moved, or to give an exaggerated idea of tank strength.

Disruptive painting of guns, vehicles, motor transport, and tents is apparently not very much used. There has been a report that both motor transport and tanks are painted light khaki and sometimes smeared with grease and sand. There have, however, been reports of armored cars painted dark green with yellow turrets. This, however, may have been some form of unit marking. Tents are reported to be the standard dark green color. Guns are painted yellow; the only concealment is provided by their sun-covers. Nets have recently been reported in use by the Germans, stretched over vehicles, and either pegged down or else extended outwards on poles. These nets are garnished with small bushes, and the like. A net or screen has also been used to disguise the presence of armored cars lying in ambush. Food and fuel dumps are concealed in pits about 18 inches deep, which are dug well away from any landmark, are well dispersed, and covered with nets and brushwood.

A recent report mentions a large gasoline dump camouflaged by a net or screen, behind which an enemy patrol, consisting, it is thought, of three trucks mounting guns, lay concealed. When the gasoline was fired on, the screen disappeared and fire was returned.

A report written by the commanding officer of a German infantry battalion throws interesting light on the difficulties caused by excessive orderliness of mind and lack of practice in individual concealment. He complains of the necessity of combating the herd instinct--"Not only man and beast fall victim to it, tents and vehicles do so also". He enlarges at considerable length on both the bunching and symmetrical dispersal of tents and motor transport, practices to

which the Germans are addicted. He also gives careful instructions on the construction of narrow and deep trenches, which must have no parapet and must be covered over, citing British positions as examples to be imitated.

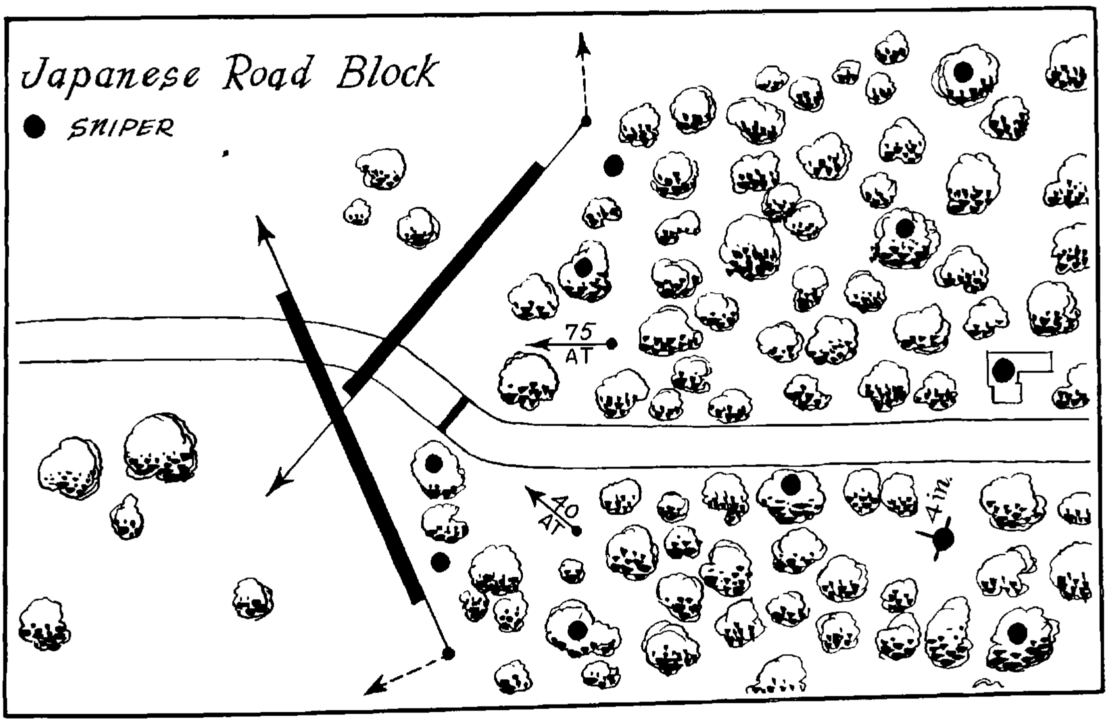
INFANTRY (TACTICAL)

8. JAPANESE TACTICS IN BURMA

The following information is based on a report by a British officer of the fighting in Burma. As will be readily seen it is not a complete analysis, but simply a collection of miscellaneous notes.

Tactically the Japanese relied for the most part on the ambush. The ambushes were generally very skillfully located, but were always on the same pattern, particularly with reference to the positions of weapons.

The chief form of enemy defense encountered was a combination roadblock and ambush. The position was invariably located at a point where woods converged on the road. Covering weapons were effectively located. Light machine guns in dispersed positions were placed forward of the woods, and snipers spotted in the woods to prevent envelopment of the position. The road-



block is also covered by one or more heavy weapons. In three instances a French 75 (probably taken in Indo-China) was encountered at a road-block. In each instance the block was in a bend of the road, and the gun was placed in a concealed position off the road about 50 yards beyond the block on a line in prolongation of the original direction of the road. To knock out this gun the area may be searched with artillery and mortar fire, but its elimination is primarily an infantry task to be accomplished by mopping up the gun crew with small arms. In addition, a 37-mm antitank gun may be placed very close to the road-block, usually on the opposite side of the road to the 75-mm gun; a 4-inch mortar may be emplaced further to the rear.

The Japanese 37-mm antitank gun is only 2 feet high, being supported on small wheels. It is thus easily concealed and is usually put in position in a ditch or in the shadow of a building. It may also be found near culverts which the crews use when being shelled.

The Japanese 4-inch mortar is not as highly effective as some reports would indicate. For effect it depends entirely upon blast and its killing power is very limited. One of its chief dangers is its incendiary powers against halted vehicles. When attacked by British mortar fire, the fire of this weapon became inaccurate. If the counter-mortar fire was at all accurate the enemy moved the gun. As soon as its position has been determined, it should be overrun by infantry. When the 4-inch mortar is used in support of road blocks it is generally emplaced near the road, but farther to the rear than the 75-mm and antitank guns.

The Japanese have invariably emplaced their light machine guns a short distance in front of the forward edge of a woods. This is done in order to escape artillery or mortar fire which may be directed at the edge of the woods. The machine guns are not dug in, but they are cleverly concealed by use of background; every precaution is taken to eliminate splash. The guns are normally fired on fixed lines along the edge of the woods. In attacking the machine guns, artillery and mortar fire should start some 50 yards in front of the edge of the woods, and the leading infantry must follow the barrage as closely as possible. Any formation in line, or bunching, by the attacking infantry is suicidal. From the jump-off point until the objective is overrun the infantry must remain widely dispersed; within platoons at least one section should be held in reserve, and sections should maintain a patrol formation.

In wood and jungle fighting the Japanese snipers presented a most difficult problem. They remained at their posts with great bravery, and in the opinion of the reporting officer they had been assigned a definite time to remain there. Snipers took positions in trees, on the ground, and in houses. The elimination of snipers in trees or on the ground is the task of the individual soldier. Care must be taken not to advance in a straight line; one should get behind a tree, observe in all directions, both on the ground and up in the tree, and then move very rapidly to a tree about 10 yards to the right or left front. This

process is repeated, and it is probable that the sniper will either be spotted or that the stalker will get behind him, and have the sniper at his mercy. Snipers posted in houses present a different problem,and experience shows that too many casualties occur if stalking is attempted. The best means of attack appears to be either to burn them out or use grenades under the protection of smoke.

The Japanese were very adept in the use of camouflage and altered their appearance according to the nature of the terrain that they were traversing. Examples of their use of camouflage were these: a green net for the helmet, long green gloves, bottle-green liquid carried to color face and rifle, different colored shirts carried by the individual soldier, and elephants colored with varying shades of green paint.

MECHANIZED VEHICLES (TACTICAL)

9. GERMAN EMPLOYMENT OF TANKS, AND THEIR COOPERATION WITH OTHER ARMS

The article summarized below comes from a handbook that is used in the German army, especially by officer candidates. It is called "Tactical Handbook for the Troop Commander" and was written by General von Cochenhausen.

Most of the German tanks are in the "Panzer" divisions, but Panzer divisions are organized in many ways. Some have one and some have two tank regiments. The infantry may be a rifle brigade made up of several motorized battalions, forming a regiment, in addition to a separate motorcycle battalion. There are as many antitank and antiaircraft units as necessary to meet the tactical situation. The whole organization depends on how many men or what equipment is available, on the task to be done, on the terrain and the nature of the hostile defenses.

Generally the Panzer division contains a division staff; a brigade of two tank regiments, each with two or more battalions of four companies each; a rifle brigade of one motorized infantry regiment, which also has a battalion of armored assault artillery and a motorcycle battalion; a reconnaissance battalion; an engineer battalion with combat bridging equipment; a signal battalion; an antitank battalion; an antiaircraft battalion; an artillery regiment; and all the necessary administrative, supply, maintenance, and medical troops.

In order to understand this text it should be remembered that the ways in which the Germans use a Panzer division vary according to the mission, the commander's conception of the terrain, and the nature of the hostile defenses.

<u>TRANSLATION</u>

"The entire force of our troops is
concentrated in the attack"-- Frederick the Great

1. <u>PREPARATION FOR THE ATTACK.</u>

a. <u>General.</u> The time before an attack should be spent in studying the terrain, preparing positions, and making arrangements to work with the other arms. The study of the terrain should cover the area from the assembly position forward to the front line, and then as far as possible into the enemy's position. The tank force commander, or an officer chosen by him, should take part in this study. Aerial photographs should be used along with the map. It is important to find out the location of mines and the position of the enemy's defense weapons.

b. <u>Surprise.</u> Surprise is most important for a successful attack. Therefore, all preparations must be carefully camouflaged. Tank units should move at night, and in the daytime they should move only when they can be hidden from enemy airplanes. The time of the tank attack must be set so that it will come as a

surprise. The enemy can be kept from knowing that an attack is coming by engaging him in a few local actions, as well as by camouflaging our radio communications or by keeping the radio silent.

c. Organization of the Tank Force. The tank force commander must decide in every case whether he is going to attack with his tanks in line or in column. An attack in column facilitates control, and makes it possible to maneuver tanks in any direction; to attack in line makes the enemy stretch out his defense, and supports the infantry attack over a broader front.

d. Objectives. Tanks set out to attack the enemy's infantry and infantry heavy weapons, artillery, command posts, reserves, and rear communications. But before they can get through to these targets, they must destroy their most dangerous enemy, the antitank defenses. For this reason the heaviest and most powerful tanks must lead the attack, and they must be supported by the other arms, both before and during the attack.

Only after the antitank defenses have been destroyed can the tanks go ahead. After that, the most powerful tanks should be directed to attack the points that are deepest within the enemy positions, such as artillery, reserves, and command posts. The lighter tanks attack the infantry. Each echelon of tanks should be definitely informed concerning its mission and its objective.

Tank forces are also able to seize important points, such as river crossings, and to hold them until the infantry comes up.

e. Assembly Positions. The Panzer division usually prepares for an attack in a position, not too near the battlefield, which gives cover against observation and is beyond the range of the enemy artillery. Here the troops should be told what they are to do, supplies should be distributed, and fuel and ammunition issued. If the tank force by itself cannot protect the position, the commander should see to it that the necessary supporting weapons are brought up.

The tanks can go to the attack more quickly if there are several roads leading from the position to the front, and if crossings over railroads, highways, and rivers have been constructed by engineers.

When time is the most important factor, tank units should remain in their assembly positions for a limited period, or they should move directly to the attack without stopping in these positions.

2. SUPPORT OF THE TANK ATTACK BY THE OTHER TROOPS.

a. Infantry. The infantry must direct its heavy machine guns against the enemy's antitank defenses. The other heavy weapons must fire at targets outside the area of the tank action so that they will not disable their own tanks. Signals must be arranged in advance (such as tracers, flags, and radio) so that coordination is assured.

b. Artillery. The artillery fires upon targets in front and to the flanks of the area of the tank action. It fires both high explosives and smoke, and must generally regulate its fire by time. Adjustment can be attained through the radio or the artillery liaison detail, which, riding in armored vehicles, can accompany the tanks.

c. Engineers. Engineers assist the tanks by strengthening bridges, building temporary crossings, and removing obstacles and mines.

d. Signal Troops. Signal troops keep up communications with the commanders, with the artillery, with the services, and with separate units of infantry, engineers, or the air force.

e. Antitank Units. Antitank guns must follow the tanks as closely as possible so as to be able to enter the fight immediately if enemy tanks are met.

f. Aviation. Aviation has two duties: it should serve as reconnaissance before and during the time the tanks are in action, and it should attack the enemy's reserves, especially tanks and antitank defenses, before they can come into action.

g. Rear Services. If a tank force does not have its own medical service, it should be kept in touch with first-aid stations of the assisting troops. During the battle the service troops are held in readiness well to the rear.

h. As soon as the tanks reach their objectives, they at once prepare themselves for a new mission. They send reconnaissance to the front and find out how far the infantry has advanced. They decide their next movement on the basis of these findings.

i. After the battle the tank force is withdrawn behind the lines and reorganized. The longer it has been in action, the longer the rest period should be.

3. EXAMPLES OF COMBAT ORDERS AND OPERATIONS.

a. General. Orders to the tank force must be kept brief and simple in all situations during a war of movement. It is enough if they tell: (1) the location and strength of the enemy; (2) the location and mission of our own troops; (3) the mission for the tank force, to include direction of attack, the objective, and sometimes the hour the tanks are to attack and their action after the attack; and (4) what support is to be given by other arms.

b. Example No. 1 (see figure No. 1) illustrates an order to a Panzer detachment in the advance.

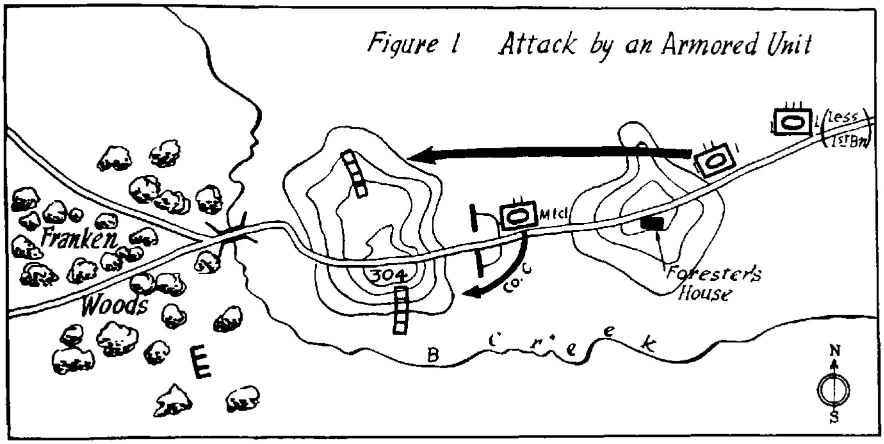


Figure 1 Attack by an Armored Unit

(1) The Order. The Motorcycle Battalion has encountered the enemy and has deployed on each side of the road in front of Hill 304.

The commander of the 1st Battalion, 1st Panzer Regiment, meets the commander of the advance guard (probably the motorcycle battalion commander) at the forester's house. After receiving brief information about the terrain, he issues the following order:

"The enemy holds Hill 304. Hostile artillery, estimated to be one battery, is firing from the direction south of Franken Woods.

"The Motorcycle Battalion deploys for attack on both sides of the road. Company C is advancing here left of the road against the southern edge of Hill 304.

"The 1st Battalion, moving north of the road, will attack Hill 304. After overcoming the resistance thereon, it will continue across B Creek to attack the enemy artillery south of Franken Woods. It will continue combat reconnaissance to the far end of Franken Woods. I want to know:

a. When the crossing over B Creek begins.
b. When the hostile artillery has been reached and overcome."

(2) The Engagement. The commander of the 1st Battalion then drives to the commander of Company A and orders him to advance around the northern edge of the woods just in front of him and to attack Hill 304. He then gives the necessary commands to the other companies by radio.

While Company A is deploying, Company B, with its left flank on the road, advances against Hill 304. Company D supports the attack from the vicinity of the forester's house. Company C, forming the second line, follows Companies A

and B, and the Battalion commander advances with it. As soon as Company A reaches Hill 304, Company D begins to displace forward to this position.

Meantime, the artillery has been definitely located south of Franken Woods. The Battalion commander now issues a new order to attack the artillery, and Companies A, B, and D proceed around Hill 304. Company C then engages the remaining resistance on Hill 304 until the motorcyclists come up from the south side. A part of Company A carries out the reconnaissance on the far side of Franken Woods.

c. Attack Against a Prepared Position. If the tanks are to attack a prepared defensive position, the commander of the force must then coordinate all the arms in his command to assist the tanks. Therefore, every arm must be told exactly what to do in an action which is intended first of all to support the tanks against the enemy's antitank weapons.

(1) Preparation. The commander tells the tank force commander about such matters as the enemy, the terrain, and the plan of attack. The tank force commander reports the results of his own reconnaissance, how he thinks the attack should be carried out, and what sort of support he wants. The commander then makes his decision and draws up the order. The tank force commander then informs his subordinates about the terrain and what he intends to do. The tank forces advance to the assembly position on the roads that the commander has assigned to them. These roads are kept free of other troops.

(2) The Tank Force Combat Order. The order should contain:

(a) Information about the enemy (his position, strength, and the location of known or suspected antitank weapons) and the position of our troops. All later messages from the front that contain information for the tanks are passed on at once to the tank force commander.

(b) Our own intentions, stated thus:
"Tank force ---- in ----, echelons ---- at (time) crosses the front line, attacks with the first echelon across ----, toward ----, advancing thence to ----. The second echelon attacks ----. After the attack the tanks will ----. (This order should give the mission and support furnished by the infantry, if a part of the tank force is not placed directly under an infantry unit or attached to it.)

(c) Artillery ----. Smoke ----.
(d) Engineers ----.
(e) Aviation ----.
(f) Signal Communications ----.
(g) Rear Services ----.
(h) Command post of the higher commander is at ---- (where reports are to be sent).

 [redacted]

d. Example No. 2 (see Figure No. 2) illustrates a typical problem for the cooperation of tanks with other arms.

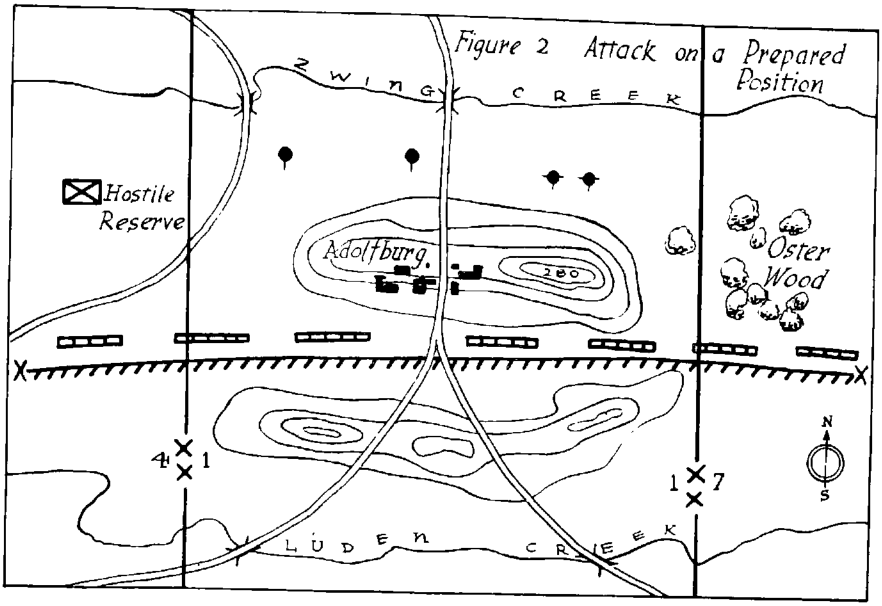


Figure 2 Attack on a Prepared Position

(1) Situation. An infantry division, encountering increasing hostile resistance, arrived at the line X -- X at 1600 hours. The division, supported by the Panzer Brigade, will renew the attack the next morning.

(2) Operations. In the morning, after a brief artillery bombardment, the widely deployed tanks break into the enemy line. The infantry push through the break. Meantime, the artillery advances its fire to the village, Adolfburg, and the Zwing Creek crossings. Smoke troops place fire on the western edge of Oster Wood. Wherever the enemy's antitank weapons are found, they are immediately engaged by heavy infantry weapons and by the tanks. Heavy artillery fire is kept up on Adolfburg. The first echelon of tanks is now advancing rapidly north around both sides of the village; the second echelon decreases its speed and attacks the enemy forces still resisting on the high ground on both sides of Adolfburg. The artillery constantly moves its fire forward so as not to hinder the advancing tanks, being informed by its own forward observers who advance with the leading tanks.

On the right, the infantry attack in the direction of Oster Wood has been checked. Guided to the place by tracers and flag signals, the second echelon of tanks moves toward Oster Wood. Meantime the commander of the first echelon reports:

"Have overcome hostile artillery groups north of Adolfburg. Am continuing toward the artillery discovered farther west. Reconnaissance toward Zwing Creek reports that the stream is passable."

The supporting infantry has been mopping up Adolfburg and the high ground on both sides of the town. This infantry now proceeds to assist the tanks at Oster Wood. Then the heavy weapons and artillery are brought forward to Adolfburg. The enemy, retreating along the road, offers stubborn resistance, but is overcome by elements of the tank battalion cooperating with the advance infantry. Zwing Creek crossings are kept under the fire of tanks, artillery, and combat aviation.

END OF TRANSLATION

COMMENT: 1. These instructions show how much emphasis the Germans put upon surprise, which is even more important in an attack by tanks than in an infantry attack. Speed is necessary, and so is concealment, but careful preparations are not to be neglected. The approaches are carefully selected, traffic regulations worked out, and reconnaissance and engineer units make every effort to secure quick, unbroken movement of the tanks from the assembly position into combat. The supply system is planned to avoid delay. Because the Germans are well trained, these arrangements are executed in a businesslike manner, which makes them look simple and easy, though they are often difficult and complicated.

2. German tank attacks are based upon an accurate estimation of the opposing strength and defenses, and the organization of their attacking force is determined by the situation. The tanks leave the assembly position in the formations they will hold during the attack. In difficult terrain, the detailed deployments are made just behind the last cover before coming into the open. Careful scouting of the position, studies of maps and photographs, the planned removal of obstacles, and the preparation of material to be used in negotiating unforeseen obstacles enable the tanks to come upon the enemy with surprise and with a mass fire effect.

3. The heavy tanks attack first to clear the way for the lighter tanks, which then operate against any resistance likely to hold up the infantry. The Germans realize that tanks must act in close cooperation with infantry, but at the same time they believe that the tanks should be free to strike hard by themselves. Therefore they plan things so that each tank unit has a definite goal to reach.

4. German artillery gives the tanks good support; to work out this support, artillery officers ride in the tanks and signal the ranges to the guns.

5. The Germans regard the tank as the decisive weapon and arrange for its support by all other arms.

6. Note in Example No. 1 of the combat orders that the tank battalion commander does not waste time by getting together his subordinates and issuing a complete order. Instead, he gives his order orally to the officers near at hand, and to the others by radio. What looks at first like a piecemeal action is actually a united effort by the entire battalion.

7. In Example No. 2 note that smoke was used along the edge of the woods; where hostile antitank and other weapons, even if observed, would be difficult to combat with tanks.

8. German antitank crews are trained to be ready for action at any moment and to fire very rapidly.

9. Not only are the tank units supported by the other arms, but the German tank units support each other. Individual tanks within the platoon, and platoons within the company, will fire while halted in concealment in order to protect other tanks or platoons advancing to positions from which they in turn will be able to protect their former supporting group.

10. FUEL SUPPLY FOR TANKS

Photographs have shown that German tanks carry a certain amount of spare gasoline in containers at the back of the turret, strapped or otherwise fixed to the vehicle. However, in the Middle East a recent document has been captured which states that it is now forbidden for any German armored vehicles to carry gasoline containers outside on racks or in any other way. This order applies to all armored vehicles including armored cars and troops carriers.

MECHANIZED VEHICLES (TECHNICAL)

11. GYROSCOPIC COMPASSES IN GERMAN TANKS

A German Mark II tank with an electric gyroscopic compass has made its appearance in Libya. It is possible that all commander's tanks may be equipped with this particular device.

The whole equipment is first-class in quality and workmanship. It is not likely that breakdowns will occur to any great extent, and the equipment should give long service without overhaul.

The main components of this instrument are the generator and the gyro, connected to each other by a flexible multicore cable. Switches for operation and lighting are fixed to the casing.

The motor generator is housed in a separate casing which may be placed

in a convenient location in the vehicle. A 12-volt motor drives a three-phase alternator supply to the gyro. The whole arrangement is compact, and appears fully suppressed and screened to avoid radio interference.

Fitted to the dashboard in front and to the left of the driver, the gyroscopic instrument consists of a small box with a panel showing two cards rotating in a horizontal plane. A switch and two control knobs, one for each dial, are added features of this equipment (see accompanying sketch).

To march on a certain point, a celluloid disk, marked around the circumference in clock-rays, is centered on the position of the tank on the map with 12 pointing due north. A thread leading from the center of the disk is joined to the point on the map which is the objective, and thus shows, in terms of clock-rays, the bearing of the objective from the tank. This is termed the "march number"

The indicator must be set before using. This is done by finding the course of the tank, setting the gyro, and starting the gyro and allowing it to gain speed. The course is set on the course-setting dial and the tank steered until the dial markings on both dials coincide.

A special compass is provided to find the tank's course. It has a glass marked with clock-ray divisions. The compass user must not stand nearer than 15 yards from the tank when finding its heading. Setting of the gyro is done by turning the gyro dial with the setting knob until it is the same as the tank's course previously found with hand compass. After setting, the gyro must be started and allowed 3 or 4 minutes to gain speed; it then must be set free by pressing the release button.

The course-setting dial is to assist the driver in keeping to his course without constantly remembering what the actual bearing is. Therefore, the dial is set to the desired course (or march number) and the tank then steered to make the top dial figures keep opposite the lower (gyro) dial.

Resetting of the indicator may be necessary, either periodically because of deviation, or because exceptional tilt temporarily interferes with the internal mechanism. When this occurs a red warning-light is shown.

12. TANKS IN BURMA

The following remarks on the use and performance of tanks in the Burma campaign represent the opinion of a British officer who participated in this fighting. They are not complete comments on the subject, since they were given in the form of answers to specific questions.

The U.S. Light M3 was found to be extremely reliable; the engine gave no trouble, overheating did not occur, and excessive oil was used only when the

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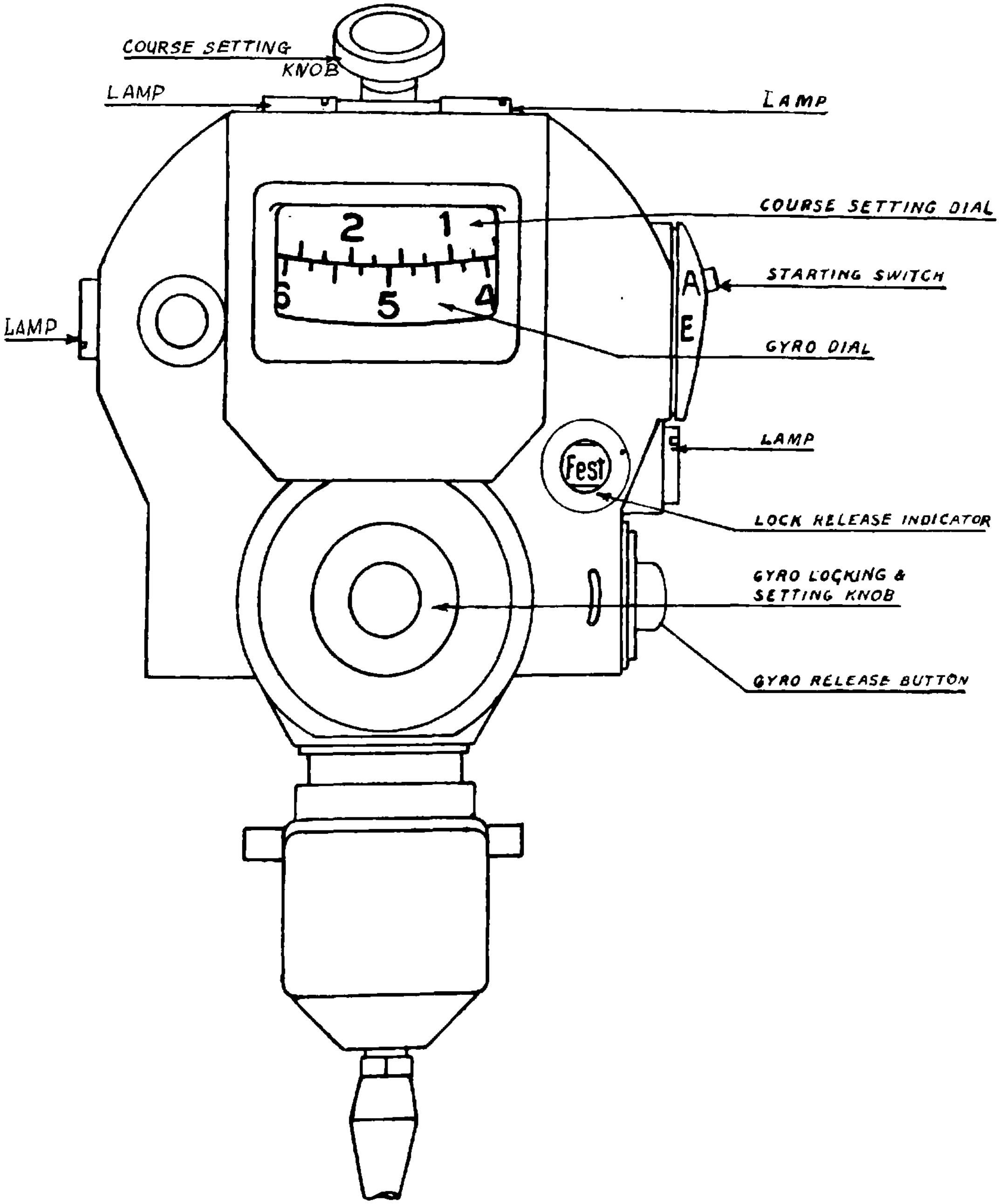

GERMAN ELECTRIC DIRECTIONAL GYROSCOPE

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100-hour overhaul period was exceeded. The sponson machine guns had been removed. It was not considered that their retention would be useful for jungle fighting since they are fixed in position, consume ammunition uneconomically, and, the space occupied is required for radio sets, etc.

It was considered that the emission of smoke from the rear of tanks would be of use in jungle fighting.

No tanks were set on fire by ammunition being hit.

Larger tanks could have been used in the campaign.

If searchlights had been available they could have been very useful in night actions.

Canister for the 37-mm guns to be used in close-quarter work against personnel would have been very useful.

Mortars on carriers to fire smoke shells would have been of value.

The Japanese used prussic-acid bombs against tanks on only one occasion. Molotov cocktails were used against British tanks, and had some temporary effect on morale but none on materiel since they burned on the outside of the tank.

Japanese tanks were small, low, and light, and poorly armored. They were knocked out by British and American tank guns at 1,200 yards. There was little chance to observe the effectiveness of antitank weapons against the Japanese tanks. The Japanese avoided tank-versus-tank actions, saving their tanks for use against unarmored troops.

The Japanese were rarely able to stop British tanks except in villages.

ORDNANCE (TACTICAL)

13. GERMAN AMMUNITION SALVAGE

A new plan by the German army for reclaiming used metal is reported in a recent captured document.

Salvaging of empty cartridge cases, belonging both to small arms and machine guns, is being encouraged by the inducement of cash payments for such deliveries.

The method appears comparatively simple. The division ammunition supply depots issue the receipts. Corps ammunition dumps act as the receivers The latter pack the collected empties in bulk and send them along to the corps

ammunition depot designated. A certificate also is sent to the effect that no live ammunition has been included.

The shipping cases are provided with sealing strips carrying:

1. The serial number
2. Contents
3. Unit stamp
4. Signature of ammunition supply depot commander.

Attention is called to the fact that particular care must be taken to return empties from all weapons, as well as the corresponding packing materials.

ORDNANCE (TECHNICAL)

14. USE OF CAPTURED ITALIAN WEAPONS

In the several North African campaigns the British have captured a large amount of enemy materiel, particularly Italian. Although some of the Italian weapons have not proved satisfactory enough to be used by the British, the following weapons have been utilized, some with interchangeable British ammunition and parts, and others with the Italian ammunition.

Breda Light Machine Gun. The Breda light machine gun is similar to the British Bren gun. It is mechanically superior to the Bren gun under dusty conditions. It requires only one man to service it as compared to several for the Bren gun. It has a slightly higher rate of fire than the British weapon. Its disadvantages are that it has no carrying handle, cannot be fired on fixed lines, and has no tripod mounting.

Breda 20-mm. Heavy Machine Gun. This is an excellent dual-purpose AA and AT gun, firing several types of high explosive, armor-piercing, incendiary, and tracer ammunition. It is particularly good for antiaircraft use, although as a weapon it is rather cumbersome. A great many of these guns have been utilized by the British, and a large number of them have been mounted on British armored cars.

81-mm. Mortar. This mortar fires an 8 1/2-lb. projectile 5,000 yards. The secondary charge is considered superior to that of the British 3" mortar, and the weapon as a whole is also considered superior and a valuable addition to an infantry unit, although the bipod is more complicated and the projectiles are inferior in fragmentation to the British.

The 75/27 Gun (75-mm., 27 calibers in length). This gun fires a 14-lb.

shell 9,000 yards, and has a rate of fire of 4 rounds per minute. It is considered a mechanically satisfactory weapon and has been used extensively, although it has the disadvantages of light hitting power and poor fragmentation. (For greater detail see next article.)

100/17 Howitzer (100-mm., 17 calibers in length). This is an accurate and satisfactory howitzer, which fires a 30-lb. shell 9,000 yards at approximately 3 rounds per minute. However, it has a long unwieldy trail that has to be dug in for high elevation.

149/13 Howitzer (149-mm., 13 calibers in length). This howitzer fires a heavy, 80-lb. shell accurately up to a range of 10,000 yds. The rate of fire is 2 to 3 rounds per minute.

105/27 Gun (105-mm., 27 calibers in length). This weapon is considered to be the most valuable battalion artillery piece, although very few of them have been captured. It fires a 35-lb. shell a maximum range of 13,600 yards, at the rate of 6 rounds per minute.

The use of all these field artillery weapons has been limited by a lack of spare parts; the recoil systems, both spring and hydropneumatic, have suffered particularly. The carriages of the 100-mm. and 149-mm. howitzers are old models, and the best performance from these weapons can be expected only when they are mounted on modern carriages. None of these weapons is considered suitable for mobile operations in the desert, but within the limitations noted they should prove satisfactory under static conditions.

75/46 (75-mm., 46 calibers in length) Ansaldo Mobile AA Gun. While this is primarily an antiaircraft gun, successful experiments in engaging ground targets have been carried out. The weapon is mechanically sound, and practically no maintenance has been required. The muzzle velocity is probably 2,500 feet per second, although it may be higher. The gun has a high rate of fire, and with a trained crew it is estimated that 20 rounds per minute can be fired. The silhouette is satisfactory and it is believed that it would be difficult to hit from a tank at 600 to 1,000 yards. The Italians camouflage the gun with light gray and dirty white colors, and from a range of 500 yards it is practically invisible, even on level ground. A speed of 25 miles per hour over good terrain and 10 miles per hour over rough terrain should be obtainable.

37/54 (37-mm., 54 calibers in length) Light Double-Barrel AA Gun. This is a tray-loaded twin antiaircraft gun serviced by a detachment of seven men. The rate of fire is 250 rounds per minute--125 rounds per barrel per minute. It is considered to be a very effective light antiaircraft gun, although stoppages are frequent unless all the equipment is kept scrupulously clean and free of sand.

102/35 (102-mm., 35 calibers in length) AA and Coast-Defense Gun. This antiaircraft weapon has a muzzle velocity of approximately 2,476 feet per second, a maximum horizontal range of 14,500 yards, and a maximum vertical

range of 31,000 feet. The breech mechanism is semiautomatic.

76/40 (76-mm., 40 calibers in length) Dual-Purpose AA-AT Gun. This is a fixed weapon and is expected to be satisfactory for antiaircraft work, but sufficient tests have not been made to give any details.

20-mm. Solothurn AT Rifle. It is a good serviceable weapon and capable of sustained fire over a long period. For a description of this weapon see this publication, issue No. 5, page 18.

15. ITALIAN 75-MM FIELD GUN - MODELS 06, 11, AND 12

The standard light field piece of the Italian army is the 75/27 weapon (caliber 75-mm., length of bore 27 calibers) of which there are three models, 06, 11, and 12. British users consider it satisfactory equipment, and find that it gives good results in spite of constant use.

Its disadvantages are: (a) light hitting-power; (b) at ranges above 6,600 yards, it is necessary to use a false angle of sight, slope the platform and dig a hole for the trail; (c) poor fragmentation effect.

Additional data on these guns follow:

	Model 06	Models 11 and 12
Muzzle velocity	1,730 f.s.	1,675 f.s.
Maximum range	11,200 yds.	9,075 yds.
Rate of fire (theoretical)	8 r.p.m.	8 r.p.m.
Rate of fire (practical)	4 r.p.m.	4 r.p.m.
Length of bore	27 cal.	27 cal.
Weight in action	1 ton	1.06 tons
Weight in draught	1.67 tons	1.87 tons
Maximum depression	-10°	-15°
Maximum elevation	$+16^{\circ}$	$+65^{\circ}$
Traverse	7°	$52^{\circ}\ 9'$

QUARTERMASTER (TACTICAL)

16. GASOLINE AND AMMUNITION SUPPLY--LIBYA

One British brigade that engaged in about a dozen major tank actions in Libya towards the end of last year appeared to follow a standard plan in keeping its tanks supplied with gasoline and ammunition.

A convoy containing 100 percent fuel and 50 percent ammunition replenishment always moved up in close contact with the battalion. This convoy was commanded by an officer with a radio set tuned in on the regimental frequency.

When it was necessary to replenish ammunition during the course of an action, as happened frequently, the convoy commander was ordered in code to send up a specific number of ammunition trucks to a point as far forward as possible. This was generally at a position a few hundred yards behind brigade headquarters. Company commanders were then ordered to send back one tank per platoon at a time to load up.

Before half of the gasoline supply of a tank had been used, the tank was refilled, if possible before action appeared imminent. The quickest method of refueling was as follows:

All gasoline trucks were sent forward even if only 20 percent refill was required. These trucks then drove around to each individual tank--the company trucks having previously been notified of the location of their company. On arrival at each tank the crew of the gasoline truck would dump large gasoline cans. From these the tank crew fills the fuel tank and also its own small, reinforced cans which are carried as a reserve supply.

When refuelling a hot tank it was found necessary to have one of the crew stand by with the fire extinguisher. There were several cases of fire while refuelling under these conditions, but with the extinguisher ready for immediate action no serious damage resulted.

ARMY GROUND FORCE COMMENT: In general, the method of refueling outlined is the normal method employed by our QM Gasoline Supply Company which is an organic part of, or attached to, motorized and mechanized units in combat.

The formation of a convoy under an officer for fuel and ammunition replenishment and charged with maintaining close contact with a unit engaged in combat, would be very desirable and should be employed, where the number of available vehicles permit such employment.

QUARTERMASTER (TECHNICAL)

17. JAPANESE RATIONS

The use by modern armies of concentrated foods is nothing new, and the development tends to become more widely exploited as the war takes on the character of large-scale activities on many fronts.

Japanese parachutists are using iron rations made in wafer form and composed of ground rice and wheat with some sesame seed. Besides this, they have an extract of mussel flesh, dried plums, preserved ginger, crushed bean meal, and nori (dried seaweed containing alkali, soda and iodine). For one meal these rations weigh about one-half pound. They have been successfully tried out in the climates of Malaya, East Indies, Philippines, China, Manchuria, and Siberia.

All foreign iron rations were previously tested, but the Japanese selected the above type as most suitable for the Japanese soldier.

It seems that the Japanese parachutists in Sumatra and Celebes had to carry considerable quantities of food, which had to be light in weight. One Japanese authority spent 17 years in research on these rations before presenting his findings to the Japanese Diet.

The Japanese have three types of field rations, a variable emergency ration, and a "peacetime" ration. Rice, sometimes barley, is the basic food in each type of ration.

a. "Peacetime" Ration. This consists of 21.16 ounces of rice, 6.6 ounces of barley, and a cash allowance per man of approximately 9 1/2 cents per day. The cash allowance is spent on meat, fish, vegetables, and sometimes for extra cooking and heating fuel. The caloric value of the ration in kind is 2,780. A total food equivalent for each man of 3,500 calories a day is allowed in barracks, and 3,700 to 4,000 calories a day is allowed on maneuvers. The American garrison ration allows 5,140 calories per day, and the field ration is approximately the same. The caloric allowance is slightly higher in cold climates.

b. Emergency Rations. These are of two types--the "A" scale and the "B" scale. In Burma, Japanese orders showed that each soldier carried rations for three days on the "A" scale and for one day on the "B" scale. Neither was to be eaten except on orders of the commanding officer when the unit was separated from its supply column.

(1) "A" Scale. This scale consists of about 1 pound 3 ounces of rice (sufficient for two meals) and one small can of mixed beef and vegetables per man. The rice, which is simple to prepare, is frequently cooked by the soldier in a small bucket carried for that purpose.

(2) "B" Scale. It consists of three paper bags of hard biscuits (sufficient for three meals).

c. Field Ration. These generally are of two types, "normal" and "special", although an "alternative" ration may be substituted for either of them. The "special" ration usually is issued when the rations are carried on

the soldier. The following table shows the make-up of the three rations:

Types of Food	Normal	Special	Alternative
Cereal or Biscuit	Rice: 23.3 oz. Barley: 7.4 oz.	Rice: 20.46 oz. Biscuit, or compressed ration: 8.113 oz.	One of the following: Rice: 30.69 oz. Bread: 36 oz. Biscuit: 24.34 oz. Compressed ration: 24.34 oz. Other cereals: 31.75 oz.
Meat or fish	Raw meat: 7.4 oz.	Tinned meat: 5.3 oz. (or) Dried meat: 2.1 oz.	Smoked salted meat: 3.175 oz. (or) Eggs: 6.35 oz.
Vegetables	Raw: 21.16 oz.	Dried: 4.23 oz.	------------------------
Pickles	Pickled radish: 2.1 oz.	Dried plum: 1.09 oz.	Salt or sweet pickles: 4.23 oz.
Flavoring	Powdered soybeans: .08 qt. Bean paste: 2.6 oz.	Powdered soybeans: 1.06 oz. (or) Powdered soybean extract: 1.4 oz. Powdered bean paste: 1.06 oz.	Bean paste: 5.3 oz. (or) Vinegar: .08 qt. (or) Sauce: .08 qt.
Flavoring	Salt: .176 oz. Sugar: .7 oz.	Salt: .176 oz. Sugar: .7 oz.	------------------------ ------------------------
Tea	Tea: .1 oz.	Tea: .7 oz.	------------------------
Nutriments	------------	Nutritive food: 1.09 oz.	------------------------
Extras	------------	Japanese sake*: .4 qt. (or) Sweets: 4.23 oz. Tobacco: 20 cigarettes	------------------------

*The chief alcoholic beverage of the Japanese; a kind of beer made from rice.

d. Vitamins. The Japanese are using vitamin tablets to supplement their rations, and also as an emergency ration in the jungle. Some of the vitamin tablets are known to consist mainly of vitamins A and D.

SIGNAL CORPS (TECHNICAL)

18. WIRE COMMUNICATION USED BY GERMANS IN OCCUPIED COUNTRIES

Full maintenance of telephone and telegraph systems in occupied countries is essential for German control. This raises many technical problems; for example, in Europe telephone communication is often made through roundabout connections; the hook-up between nearby rural subscribers is often put through by means of connecting-junctions terminating at distribution centers, often a distant town.

In case of breakdown, whether due to sabotage or other causes, the Germans decided that machine switching systems were too complicated to permit quick resumption of operations. In some cases, they provided against this by installing manual boards, suitable for connection to the main frames of a telephone distributing center. This permitted them to reestablish an immediate restricted service.

In occupied European territory, the Germans have employed 4-wire rubber-covered cables with encased loading coils inserted in the cables by means of coupling joints. Thus, two physical circuits and a phantom circuit were obtained from each cable. The cables were strung on convenient objects, such as branches of trees, or laid on the ground, sometimes in groups of perhaps 20. The outer diameter of the cable was about 3/8 in., and that of the loading coil container, about 2 in. At elevated points, short lengths of cable comprising loading coil assemblies were looped and suspended to relieve strain.

SECTION II

THE GERMAN CROSSING OF THE DNIEPER IN THE KREMENCHUG AREA (KIEV OPERATION)

THE GERMAN CROSSING OF THE DNIEPER IN THE KREMENCHUG AREA (KIEV OPERATION)

INTRODUCTION.

1. GERMAN FAILURE BEFORE MOSCOW AND KIEV, AND PLANS FOR KIEV ENCIRCLEMENT. August 1941 saw the German Center Group of Armies under von Bock halted in front of Moscow, and the South Group of Armies under von Rundstedt halted in front of Kiev (see map at page 42). There was now no chance for a quick seizure of the capital and a drive by armored spearheads to other strategically important parts of the country as had been the case in France. Plans were shifted to achieve a gigantic double encirclement, which would aim at the capture of the great Ukranian city of Kiev and the destruction of Budenny's armies. The salient between the Desna and the Dnieper, with Kiev at its apex, was to be cut off in a wedge-and-trap operation. The holding attack would be made by the forces which were already in position in front of Kiev. The northern wedge of the encirclement maneuver would have to be driven across the Desna northwest of Konotov, and the southern wedge across the Dnieper below Kremenchug. As preliminaries to the main operation, Uman to the south of the proposed salient and Gomel to the north would have to be taken in order that German troops might advance to the Desna and the Dnieper.

2. IN THE SOUTH -- THE UMAN OPERATION. While the Sixth Army under von Reichenau was halted in front of Kiev, the German armies in the south had been moving forward in conjunction with Hungarian and Rumanian troops. Von Stuelpnegel's Seventeenth Army and von Kleist's First Panzer Army crossed the Bug west of Uman. They helped von Schobert (who had crossed the Bug further south) in the encirclement of Uman and then occupied the right bank of the Dnieper River.

3. IN THE NORTH -- THE GOMEL OPERATION. Von Bock kept up the feint of striking toward Moscow, but shifted to the south the Second Panzer Army of Guderian and the Second Army of von Weichs. These armies encircled Gomel, which fell on August 19, and moved toward their new assembly areas. Guderian reached the Desna near Novogorod on August 30 and immediately established a bridgehead on the south bank. The advance of the von Weichs and Guderian armies toward the Desna also relieved Russian pressure on German forces (von Reichenau's army) west of Kiev.

4. THE SITUATION. Thus, toward the end of August 1941, the situation was as follows: in front of Kiev the strong army of von Reichenau was in position to launch a holding attack; the von Weichs and Guderian armies some 125 miles to the northeast, and the von Stuelpnegel and von Kleist armies some 190 miles to the southeast, were the potential wedges for encirclement of the Kiev area.

But the maneuver could not be begun, much less completed, until a German bridgehead was established east of the Dnieper. The crossing of this broad and deep river, the third largest in Europe, would have to be attempted in the vicinity of Kremenchug. The operation was entrusted to the Seventeenth Army under von Stuelpnegel, but, according to German custom, the specially created

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THE KIEV ENCIRCLEMENT

MAP LEGEND

(A) Von Bock's drive toward Moscow halted by Timoshenko's Group of Armies. (B)

(C) Von Rundstedt's drive toward Kiev halted by Budenny's Group of Armies. (D)

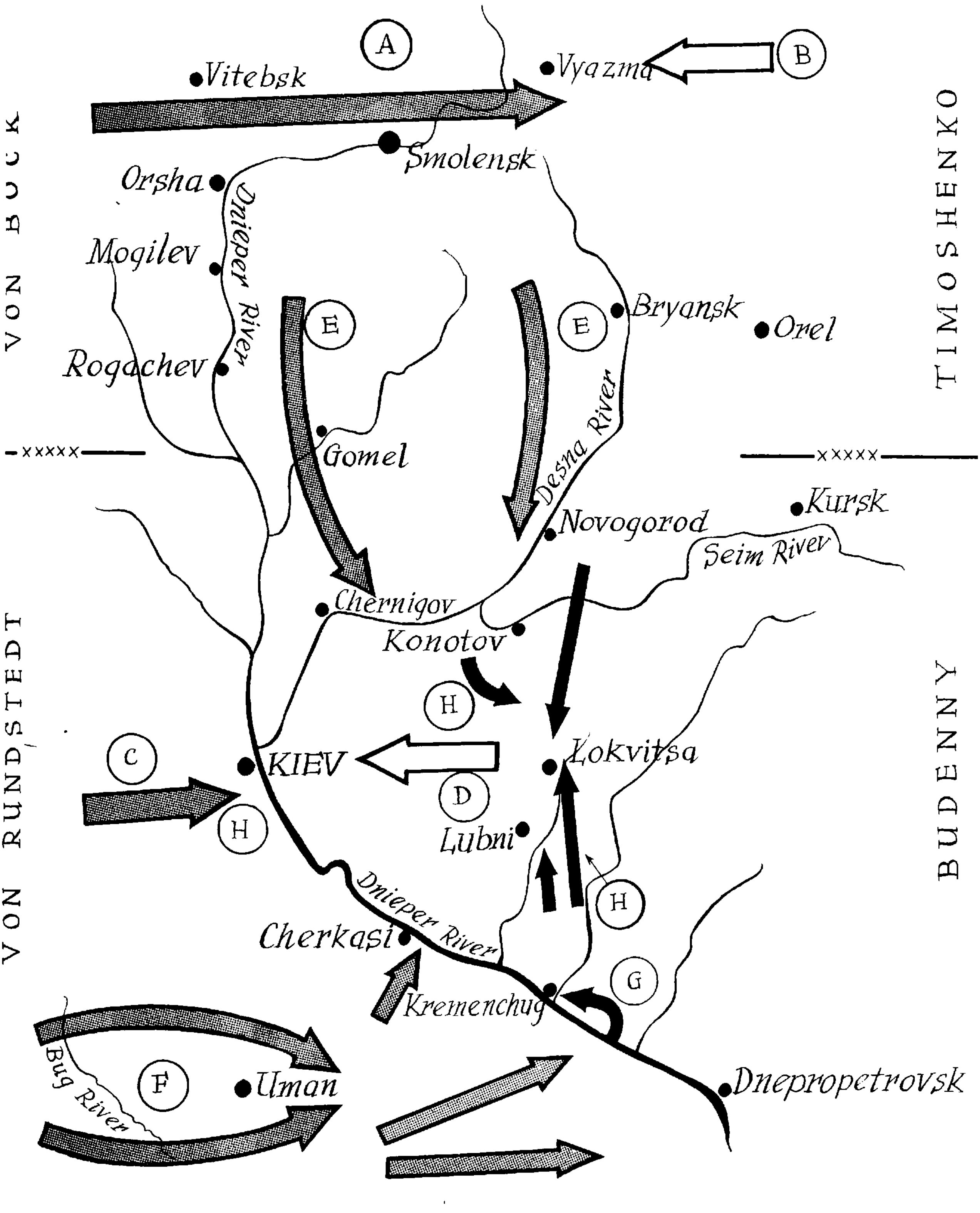
(E) The von Weichs and Guderian Armies (von Bock Group) advance to the Desna.

(F) The von Stuelpnegel, von Kleist, and von Schobert armies (von Rundstedt Group) advance to the Dnieper.

(G) The initial crossing of the Dnieper.

(H) The "wedge and trap" encirclement of the Kiev salient.

THE KIEV ENCIRCLEMENT



task force was composed of units deemed to be best qualified, irrespective of the command to which they belonged.

THE OPERATION

5. SELECTION OF A CROSSING POINT. The general considerations which influenced the German choice of a point for this difficult operation can be seen by reference to the map (see map at end of article).

The area between Kiev and Kremenchug was in every way ill-adapted to crossing operations. From Kiev to Cherkasi, the eastern bank is swampy, and roads would permit the Russians to move troops and supplies easily to a threatened area. Furthermore, a wedge driven across in this area would fail to secure the maximum strategic effect, in that fewer Russian forces would be cut off in the resulting pocket. Between Cherkasi and Kremenchug a crossing is almost impossible; the Dnieper wanders in numerous channels, much of the terrain is marshy, and a tributary (the Tyasmin) parallels the Dnieper on the south.

The area chosen for the crossing, about 25 miles southeast of Kremenchug, possesses several obvious advantages. The Dnieper flows in a single channel, 1,200 yards wide; there are no tributary streams; and the banks are free from swamps. Moreover, in this area the railroads and roads favored the Germans rather than the Russians. On the German side of the river, the Dnieper valley road would be useful at all stages of the operations; on the Russian side, there are no roads to bring reinforcements close to the point of crossing.

A particular feature of the terrain helped the Germans concentrate for attack at this point. The area southwest included a watershed ridge running perpendicular to the river. This ridge was wooded and had sandy soil. The Germans could bring men and supplies by road and rail to a point 30 or 35 miles from the crossing point and advance under cover of the woods, over what was in effect a natural highway almost to the river. The absence of roads would not prevent armored and supply vehicles from negotiating this route.

On the Russian side, the terrain was adapted to exploitation of a successful crossing. Once a bridgehead was established, the Vorskla River would protect it on the right flank, while on the left no natural barrier impeded a German advance toward Kremenchug. North of Kremenchug, the terrain is ideal for a maneuver of envelopment by armored forces. A watershed ridge gave a good route for advance northward by armored units, regardless of damage done to highways or railroads. Each flank of this route was protected by a swampy river.

6. PREPARATION. Very little information is available on the German preparations for this crossing. In view of its difficulty, and of the importance attached to this operation in the strategy of the campaign, there can be little

doubt that a task force was prepared for this assignment according to the usual German principles. These may be summarized as follows:

a. A commander for the task force is selected and given sole responsibility for the operation.

b. He is given troops and materiel according to his estimate of requirements. (This would include, in an operation of this sort, all types of infantry and artillery units, a heavy air component, and important pioneer and transport units.)

c. The commander organizes and trains the units for the specific task assigned. If possible, this is done on terrain similar to that of the proposed operation. The object of this training is to develop a combat team thoroughly rehearsed in all stages of the assignment.

Preparation for the Dnieper crossing involved concentration of considerable supplies of weapons and other necessary materiel. This concentration had to be made as close as possible to the place of projected crossing.

The most serious logistical problem was that of bringing up boats and bridging materiel. German accounts state that hundreds of assault boats were used on the Dnieper River. These boats apparently were of two types--one capable of carrying from 4 to 6 men, and one capable of carrying 10 to 16 men. Both were driven by outboard motors. It is not known how many of these boats were used in the operation, but if "hundreds" were used the problem of transporting and concealing them was an operation of considerable magnitude. Equally difficult was the problem of concealing sufficient pontons and platforms for the construction of a 1,200-foot bridge. Apparently there were enough trees on the sandy ridge to afford cover, yet not so many as to block the movement of wheeled or tracked vehicles.

In this wooded area, camouflage by tree limbs was easy, effective, and much used, as is shown by German photographs. German camouflage emphasizes the value of dummy positions which cause the enemy to waste his ammunition and reveal his position, and which divert suspicion from important concealed installations or supplies. It is quite likely that such positions, with indications of boats and bridging equipment, were constructed at other points on the Dnieper in order to deceive the Russian observers as to the area chosen for the initial crossing.

Concentrations at secondary points along the Dnieper were apparently not so well guarded from Russian air observation. These other concentrations were made partly to divert suspicion from the preparations for the initial crossing, and partly to have heavy weapons and supplies ready for later crossings which would follow after the success of the initial operation.

7. THE JUMP-OFF. By the end of August, the subordinate commanders charged with execution of the preliminary operations were able to report to the task force commander that they were ready.

At dawn on the morning of August 31, German planes took possession of the sky in the Kremenchug area. German artillery threw a heavy barrage across the river against the Russian lines. At the same moment, hundreds of assault boats were taken from their hiding places and carried down the gently sloping sandy banks to the shallow water at the edge of the Dnieper. The boats, which were designed for this particular type of operation, were probably similar to those which crossed the Rhine in somewhat less than a minute in the Maginot operation (June 1940). No reports have been seen on the time required for the storm boats to cross the Dnieper, but their attainable speed is variously given as 30 to 40 miles per hour.

The boats were not beached at the eastern bank but returned at once for further loads. The speed of the turn-around is to be noted; it is said that the men jumped from the boats as they turned without coming to a complete stop. The small boats carried about 4 men, and the larger boats (judging from pictures) seem to have carried 10 to 12 men. The carrying of less than the maximum loads may have been designed to permit a speedier crossing.

The Germans report that the Russians, taken by surprise, nevertheless immediately organized a determined resistance. Since the steersmen of the German boats stood up, many were killed by the Russian machine-gun fire, which was withheld until the boats were near the shore, but in each instance another soldier took the helm. Preparations had been made for plugging bullet holes immediately, and many boats that received hits were thus enabled to continue across the river. German photographs show spouts of water in the Dnieper caused by Russian artillery shells, and also show sand clouds produced by Russian shells bursting only a few yards from German concentrations on the eastern side. Russian resistance cost the Germans many assault troops, but not enough to endanger the success of the operation.

8. FORMATION OF A BRIDGEHEAD. As soon as the German assault troops reached the far bank, they immediately began to overcome enemy resistance. The boats crossed the river again and again. The special river-crossing units were followed by more assault troops and by pioneers, and then by the infantry. By noon, enough troops had been ferried over to make the Germans feel that their position was secure. During the afternoon they transported more infantry and further organized their bridgehead. All these operations were continuously reconnoitered and protected by units of the German air arm.

The passage of troops and materiel was now increased by the use of additional, more vulnerable transport. Inflated rubber boats were used for ferrying more men--some 10 to a boat--and ammunition. Large rubber rafts were loaded with heavy infantry weapons, especially antitank guns. These rafts were towed to the eastern side of the river by motor boats. The Germans

also prepared ferries consisting of pontons lashed together to support a platform on which heavy guns were towed across the river to be used in neutralizing and capturing the field fortifications of the Russians.

In the meantime the troops which had been transported earlier in the day advanced and took the sand dunes and low hills beyond the opposite shore. The enemy line of artillery observation was thus in German hands. Many troops were now on the Russian side of the river and much materiel had been transported. Since the area was not occupied in force by the Russians, and possessed neither roads or railroads, there was no possibility of an immediate heavy Russian counterattack. Thus, in a single day, a strong German bridgehead had been established. Since they had been carefully rehearsed by specially trained troops, the crossing operations were carried out successfully without great losses.

9. CONSTRUCTION OF THE BRIDGE. Transport by storm boats, inflated rubber boats, and pontons had been effective, but loading and unloading was necessarily slow. The bridge was needed and, with air superiority in the area and artillery already in place on the Russian side of the river, the Germans did not hesitate to proceed with its construction. This was accomplished in a single night (August 31-September 1), and the next day supplies and troops were pouring across the bridge.

It seems certain that the bridging equipment used in the crossing below Kremenchug was of the type which the Germans refer to as "bridge-gear B": equipment tried out in Poland, perfected, and used for the crossing of the Rhine in the Maginot operation in France.

The basic unit in the construction of a German military bridge is the half-ponton. This is built of metal except for strips of wood on the gunwales. It is 25 feet long, 6.3 feet broad, and 3.3 feet deep. The weight is not known. Half-pontons are used in constructing 4-ton and 8-ton ferries, and sections of 8-ton bridges. Two half-pontons locked stern to stern form a full-ponton. The full-pontons are used in constructing 8-ton and 16-ton ferries and sections of 16-ton bridges. As soon as the pontons are in the water by the shore, The Germans construct platforms on them.

The maneuvering of the bridge section or the ferrying of a ponton-supported raft is accomplished by rowing, by the use of storm boats, by the use of "M" boats (a powerful light motor boat of 100 h.p.), or by the use of outboard motors on the pontons themselves.

German bridging equipment includes prefabricated metal material for building piers at the shore. However, such piers were not needed at Kremenchug Photographs show that the bank was well drained and sloping, and ramps could easily be used to connect the shore with the ponton-supported bridge.

10. ENLARGEMENT OF THE BRIDGEHEAD. By the end of August 31, the Russians realized that a major threat had developed. Russian planes made repeated but unsuccessful efforts to destroy the bridge, and also attacked the

points of German advance. Hastily assembled Russian reserves made heavy counterattacks with tanks. The Germans, however, maintained their bridgehead, and extended it upstream to threaten the Russian position at Kremenchug.

11. ADDITIONAL BRIDGES AND BRIDGEHEADS. The Germans gradually enlarged their tactical bridgehead on the east bank of the Dnieper into a strategical bridgehead. Land operations to the northwest reduced enemy resistance 15 miles upstream, at another area free from swampy banks and multiple channels. To gain another route across the river, a second bridge was built at this point, apparently during the night of September 2-3. German reinforcements poured across the new bridge, only 10 miles below Kremenchug. Under their flank attack and a frontal attack from the west, Kremenchug fell on September 8, and the Germans had secured the controlling center of a road and railroad net.

Whether or not the Russians had destroyed existing bridges is not clear. In any case, the Germans felt the need of better transportation across the Dnieper at Kremenchug, and decided to move to that point the bridge which had been constructed 10 miles downstream. The sections were detached and towed upstream during a single night, in a rainstorm, and the bridge was rebuilt at a place where it could serve the Kremenchug road net.

Meanwhile, the Germans had established other bridgeheads across the Dnieper further down the river. These bridgeheads doubtless had the double purpose of paving the way for further operations in the Dnieper Valley and of preventing the reinforcement of Russian troops further north.

12. THE PINCER MOVEMENT BEGINS. With the eastern bank of the Dnieper at Kremenchug in their possession, and a strong bridgehead established, the Germans had accomplished the most difficult part of the large-scale pincer movement which was to isolate Kiev and destroy a considerable portion of Budenny's armies. The way was now clear for the southern wedge to move. With the First Panzer Army on the right and the Seventeenth Army on the left, the Germans advanced northward along the strategic ridge of high ground from Kremenchug toward Lubni and Lokvitsa, their flanks protected by marshy tributaries of the Dnieper. Meanwhile, from the Desna, the Second Panzer Army moved southward protecting the advance of the Second Army. At Lokvitsa and at Lubni the armored spearheads which had crossed the Dnieper met those which had crossed the Desna, to complete a gigantic double encirclement. The Russians of the Kiev salient were in a trap. The Sixth Army joined the Second and the Seventeenth in the annihilation and capture of Russian forces, while the two Panzer armies protected the operation and moved toward their next objectives. This successful wedge-and-trap maneuver had been made possible by the river crossing at Kremenchug.

13. SUMMARY AND CONCLUSION. Air superiority is absolutely essential to the success of an operation such as the initial German crossing of the Dnieper below Kremenchug. Airplanes were used in the initial phases for reconnaissance, and to deny reconnaissance to the Russians. Combat aviation guarded the sky

above the bridge. Bombardment aviation was doubtless used to harass and neutralize the Russian lines as German troops moved across the newly constructed bridge.

The German success in the Kremenchug operation, especially in the initial stages, owed much to surprise, which they achieved by the secrecy of preparations, by deception, and by very rapid execution.

Deception was achieved by obvious preparations for a river crossing at other points in order to draw the defending forces out of position. The incomplete evidence suggests that either actual attempts or feints at crossings may have been made at points other than the one described above. An attempt at Dnepropetrovsk, of uncertain date, is known to have been repulsed.

Speed of execution aided the Germans enormously. By the end of the first day (August 31), the Russians knew that the operation was of major importance, but the speed with which the Germans built the bridge and moved their forces across the river enabled them to establish a large bridgehead, and prepare to extend it, before adequate Russian forces could be brought up.

In river crossings the Germans send over antitank guns very early in the operation in order to neutralize local tank attacks. Infantry supporting weapons (75-mm and 150-mm howitzers of the infantry regiment) are also ferried over early to support the operation of enlarging the bridgehead.

In the Kremenchug operation, the construction of the first bridge did not commence until after the assaulting formations on the far bank had captured the line of artillery observation; even then the construction was carried out under cover of darkness. Normally, in crossing smaller streams, the bridge-building operations start much sooner, in some cases before the site is clear of small-arms fire. When speed of execution is being employed to achieve surprise, as is often the case with armored forces, much time can be saved by an earlier start even though a few casualties must be accepted. The over-all gain justified those losses.

The German forces employed in the difficult initial crossing of the Dnieper below Kremenchug attribute their success to the secrecy of their preparation, thus exploiting the principle of surprise to the maximum; to good staff work in the careful tactical and technical preparation; and, finally, to boldness and skill in the execution of the plans.

MAP LEGEND

A. Site selected for crossing. Here river is narrow and has neither multiple channels nor swampy banks.

B. Watershed on which Germans concentrated men and material.

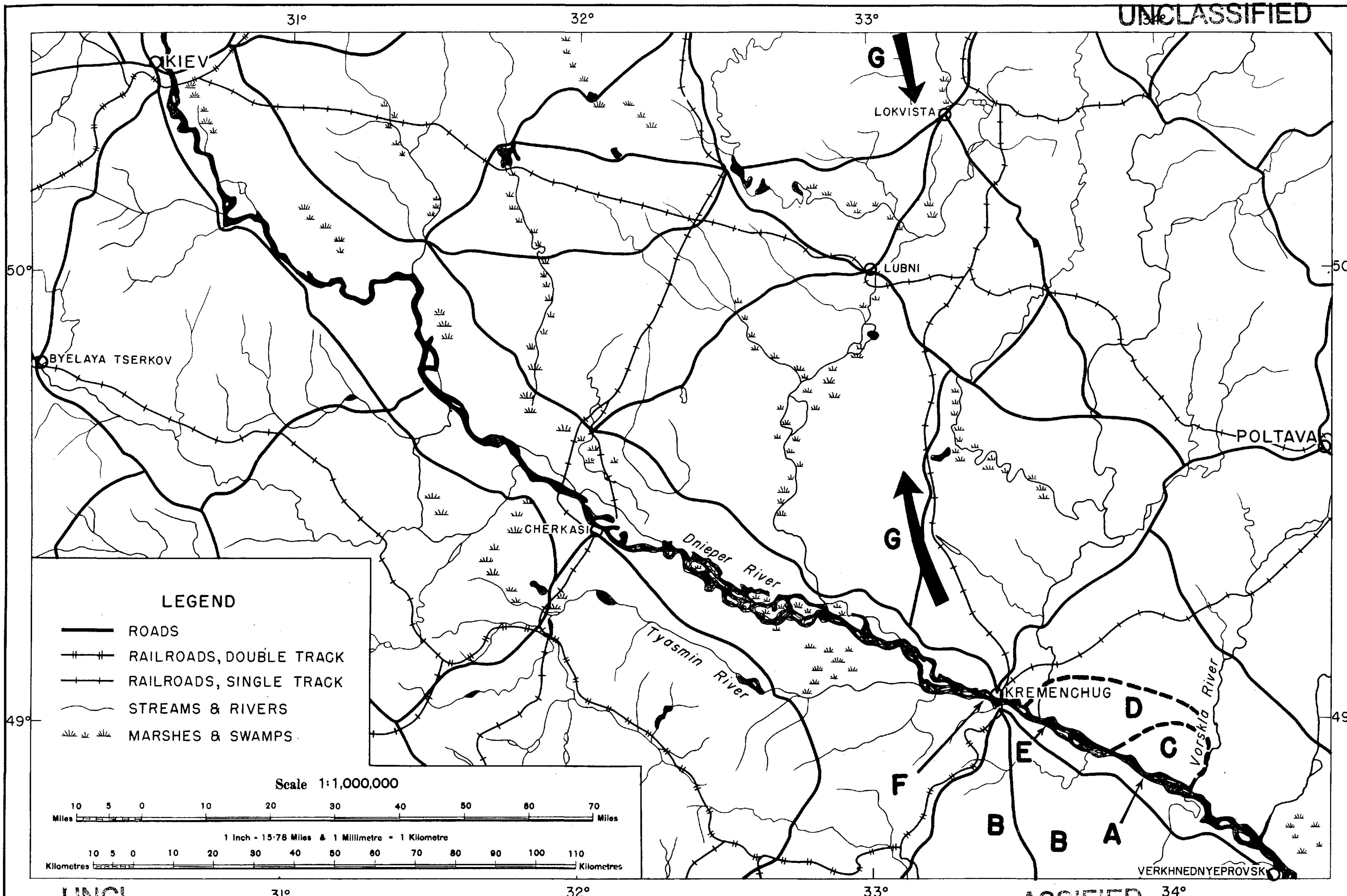
C. Bridgehead area. Protected on east by Vorskla River and has no roads or railroads for use of Russians in bringing up troops and equipment.

D. Enlargement of bridgehead. Flanks Russian position at Kremenchug.

E. Site of second bridge across Dnieper.

F. Germans take Kremenchug and move bridge from "E" to "F", in order that it may serve Kremenchug road net.

G. Advance of German armored troops northward to Lokvitsa and Lubni where they effect junction with similar spearheads moving south from the Desna River, thus completing the meeting of the wedges in the "wedge and trap" maneuver.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RAILROADS, DOUBLE TRACK
RAILROADS, SINGLE TRACK
STREAMS & RIVERS
MARSHES & SWAMPS
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1 Inch = 15·78 Miles & 1 Millimetre = 1 Kilometre
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TACTICAL AND TECHNICAL TRENDS

No. 8

September 24, 1942

Prepared for

ARMY GROUND AND AIR FORCES AND SERVICES OF SUPPLY

by

MILITARY INTELLIGENCE SERVICE, WAR DEPARTMENT

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To facilitate the obtaining of complete reports where excerpts only are presented in the bulletin, each item will be numbered consecutively. In referring to them, it is requested that you do so by number together with the date and number of the issue itself.

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SECTION I

TACTICAL AND TECHNICAL TRENDS

1. LESSONS FROM CRETE IN ANTIPARACHUTIST TACTICS

The following account of the parachutist attack on Crete is based on a report of a British junior officer who commanded a light antiaircraft unit during the attack on that island. The ideas expressed are those of the officer concerned, based on his own experience, and are not to be taken as official. Moreover, since this operation, certain developments have taken place in the tactics used by parachute troops.

The attack on Candia started on May 20 with a heavy air bombardment which lasted for 2 hours. At the end of this time the Ju-52's carrying parachutists arrived on the scene and proceeded to drop their cargo. The procession came in three waves, one to the east of this sector, another to the west, and the third one over the center.

The reporting officer stated that "those dropped on the central sector dropped right on top of my gun position, with the result that my small party of 25 men had to deal with vastly superior numbers of parachutists.

"We did more than deal with them, however. We almost completely destroyed them, for if an immediate attack can be made on parachutists the second they leave the plane and touch the ground, they are almost powerless to resist. By capturing and destroying their containers, which carry all their weapons, and by pulling down the distinctively colored parachutes marking the containers and rallying points, we managed to prevent them from getting any weapons and assembling.

"In my experience, the lessons that we learned were the following:

"Speed of action--you <u>must</u> attack them with all your available forces, however small, at the earliest possible moment, i.e., as soon as they leave the plane.

"Destruction or capture of containers and rallying points.

"By either confining them to the smallest possible area, or by widely dispersing them into small pockets, prevent them from getting supplies.

"By strict and careful camouflage, try to make them land on top of you, for the closer to a defended locality they descend, the less of a menace they become."

The mission of parachutists may be the creation of diversions, harrassment, occupation of key points, or the destruction of certain definite objectives such as factories, radio stations, antiaircraft batteries, fire-control stations, and the like.

There is always a preliminary aerial bombardment. During this bombardment the carriers approach in formation. The bombardment ceases, and the parachutists jump at heights between 300 and 500 feet. The individual parachutists land with quite a bump. Some of them are badly winded. Some have

difficulty in managing their parachutes. Others may even be dragged by their parachutes. It takes an appreciable length of time to get clear of their parachute harness; then a dash is made for the arms containers which have also been dropped in parachutes, usually of a distinctive color. After the containers are opened and the arms obtained, some little time is required to rally and assemble into units.

The parachutists have a definite objective, and everything else is disregarded. In cases where a definite objective may not have been set, or where possibly a drop was not made in the right place, harrassing positions are quickly found, such as houses, trees, shrubbery, corn-fields, ditches, and sunken roads.

Intercommunication and communication between air and ground was amazingly good. After landing, contact was continuously maintained with reconnaissance aircraft by the use of Very lights, flags, and radios.

Once on the ground and collected into units, the parachutists became rather immobile, light infantry with a very high fire-power. However, as the descent is made with only limited supplies, there is a time limit to the fire-power if supplementary ammunition supplies are not received.

Parachutists land with food and supplies for 48 hours. Fresh supplies are dropped in the same manner as were the parachutists. The same type of aircraft is used, and they approach in the same formation as in the actual parachute attack, dropping supplies in the occupied areas daily. Reinforcements are dropped by parachute to assist units in difficulty.

Antiaircraft artillery and pursuit-aircraft assistance is of course invaluable for the defending forces, but, as in Crete, may not always be available.

Camouflage of ground positions is most important. Troop positions, particularly antiaircraft or field artillery positions which can be identified from the air, will be subjected to merciless air bombardment.

Troop positions should be provided with slit trenches. These should be inconspicuous, and loose soil should be disposed of so as not to attract attention.

Strong points should be selected and organized for all-round fire; if possible, they should be so situated as to give mutually supporting fire.

Strong points and other positions should be wired in, but a small gap should be left to enable the garrisons to make rapid sorties to attack the parachutists promptly during the first vulnerable minutes. Such gaps should be closed with trip wires provided with bells, or tin cans that rattle, in order to provide a warning to the garrison.

When the troop carriers arrive and are dropping or about to drop parachutists, effective results can be obtained with light automatic weapons by firing at the doors of the aircraft. In general, rifle fire should be held until the para-

chutists hit the ground, when they become sitting targets. This is especially so with troops who are not specialists in the use of the rifle. However, particular men known to be first class shots may be given permission to "pot" the parachutists during their descent.

It is essential to attack the parachutists with all automatic arms, rifles, and bayonets immediately upon landing. Pistols did not prove particularly effective in Crete.

The time factor is of the greatest importance:

For 30 seconds after landing parachutists are incapable of action.
For 2 minutes they are more or less helpless.
From 3 to 5 minutes before they can get organized, they are very vulnerable.

Certain men must be detailed whose sole job is to collect or destroy arms containers and their contents.

(Note: Although not mentioned by this officer, other officers who served in Crete have stated that British troops, particularly service units, who were not well armed with automatic weapons, were able to do very well with the German submachine guns which they took away from parachutists or got out of captured containers.)

Another squad should be detailed to recover and hide (or destroy) the colored parachutes which are used to mark arms containers, rallying points, officers, etc. Colors vary with each attack. In this officer's opinion, submachine guns, rifles, or bayonets are the best weapons with which to attack parachutists. Revolvers were not of much use (the soldier who is a well-trained pistol shot is a rarity).

A supply of hand grenades is very useful for dislodging parachutists from houses and strong points.

Each defensive strongpoint should be self-contained, with plenty of ammunition and food and water for several days--7 to 10 days emergency rations.

Every unit and subunit from base workshops to front-line troops, every man--infantry, artillery, cook, or clerk--must have a job to do and know it perfectly. There must be no spectators--no neutrals.

The time factor cannot be overemphasized.

Each unit must be drilled and officers must have in mind several tentative plans. It is most difficult to guess beforehand exactly where the parachutists are going to land, so probably a very simple plan in the nature of a rough outline is best. But in his mind's eye, the commander must visualize every possible form of attack so that in the 30 seconds after the drop begins, he

knows exactly what he is going to do.

Dispose of the first batch of parachutists as quickly as possible, as they are nearly always followed by a second batch who come down in greater force in the same area, probably about an hour later.

As soon as they land, kill everybody possible. Confine the remainder in the smallest possible area. Confuse the enemy aircraft as much as possible by firing captured Very pistols and laying out captured signal flags. (After a little experimenting with captured Very pistols isolated British units in Crete discovered the signals that brought food. As the German air transport system was quite efficient these units did not go hungry.)

When the enemy are dropping supplies, send out patrols to capture or destroy these supplies. Or, if this is not possible, cover the areas where supplies have been dropped by machine-gun or artillery fire.

Tanks are invaluable for mopping up.

Don't waste men.

Isolate them, starve and smoke them out.

2. NOTES ON JAPANESE AIR TACTICS

The Japanese fighter most commonly encountered is the Mitsubishi "Zero," which came into production in 1940. The following comments are largely applicable to this type of fighter plane.

Tactical practices employed by Japanese fighter aircraft vary according to the situation and the type of opposing aircraft encountered. A formation frequently used by the Japanese for ground attack is a Vee of three aircraft flanked by echelons of two. When fighter opposition is encountered the echelon "pairs" meet it, while the Vee executes the ground attack.

Zero fighters ordinarily attack a bomber singly from the rear, diving under it, pulling up into the belly, and firing until they fall off the wing in a stall turn. They attack B-17D's in the tail but make frontal attacks against B-17E's. Recently it was reported that Japanese pilots in the Aleutian area, becoming increasingly bold, attacked B-17's and B-24's from all directions, side and front and underneath, interception taking place at 20,000 feet.

In one instance, a flight of Zeros approaching at 22,000 feet rose to attack B-17's in Vee formation at 28,000 feet. One Zero consistently attacked by climbing up and under the belly of a B-17, stalling and falling off while the other Zeros in the flight acted independently, and flying parallel to the other B-17's for some distance ahead before turning to make direct frontal attacks.

In another instance, nine Zeros, flying in loose echelon formation at 6,000 feet, intercepted from ahead, and at the same level, two 3-ship elements of B-17E's, one below the other, at 4,000 feet. The leading Zero made an attack directly from the front; the other eight planes divided into two groups, one on each side of the B-17E's, and pulled into parallel flight without attacking. Individual fighters then darted ahead, turned sharply, and attacked the staircase formation of B-17E's from the forward quarter before coming within range of their rear gunners. A few planes passed underneath the B-17E's and out toward the rear. Less than 50% of attacks of this nature were pressed within effective range of the Japanese guns.

It is the usual practice in attacking a B-26 for a flight of three Zeros to detach itself from the remainder of the squadron, divide into two elements of one and two fighters respectively, and fly, out of gun range, on each side of the B-26. The single Japanese fighter on the right then turns slowly, and at a slightly lower altitude attacks the B-26 from the forward quarter. The two Zeros on the left side of the bomber make the same approach, but more quickly. The Zero on the right then zooms under the B-26 after attacking it and climbs ahead to take the left flank, while the two planes formerly occupying this position make a similar maneuver and become the right element. After a head-on attack against our fighters, Japanese pilots often go into a turn resembling a tight Immelman, involving a steep climb and a flip-over to a half-roll at the top of the loop.

It is reported from Alaska that two float-plane fighters (probably Mitsubishi-Zero fighters equipped with single floats) attacked United States bombers, out of gun range, and then took up positions, one to the left, and the other to the right front oblique. They preceded the attack by an Immelman turn, and then made rapid diagonal crossings of the bomber, one of the fighters attacking when the bomber attempted to bring its nose guns to bear on the other.

Japanese fighters follow up their attacks on airfields by strafing grounded planes. The Zero and T-97 aircraft are used in these low-flying attacks. In the early stages of combat, tracer bullets are employed to get on the target, the attack being carried out with machine-gun and light-cannon fire.

General tactics used by the Japanese prior to July indicate that their Zero fighters disengage from combat by making turns, and that they avoid long power dives. Current reports, however, affirm that power dives have been employed in following P-40E's and P-39's, Zeros having attacked a P-40E at 24,000 feet, again after a dive to about 10,000 feet, and a third time at 300 feet. This maneuver may indicate the introduction of a structurally stronger Zero or a new type of fighter plane. A general practice also is the use of decoy aircraft with top cover.

Bombing tactics call for close formations and straight, long runs, frequently at altitudes of 22,000 to 24,000 feet. Flights are often composed of 27 aircraft with Zero fighters weaving above, below, or to port. When forced to bombardment ceiling by antiaircraft, as in the Philippine campaign, the Japanese used area bombing. The bombers fly in large formations and release bombs

either in salvo or in train, depending upon dispersion to encompass the target. Spot or precision bombing, which is more accurate than area bombing, is undertaken when there is no defensive antiaircraft fire, and is delivered from altitudes below 10,000 feet.

A bomber formation over Darwin was reported as consisting of a starboard flight of nine bombers at 21,000 feet, a middle flight of the same number in line but stepped up about 240 feet, with the right flight similarly stepped up, and the escorting aircraft weaving continuously. This method gives the starboard flight a greater field of fire and eliminates the need for fighter protection on this side.

Glide-bombing is usually undertaken by light bombers, the attack being launched at approximately 19,000 feet. When this maneuver is employed, aircraft nose down toward the target at an angle of about 45 degrees and level off at from 3,000 to 2,500 feet before releasing their bombs. If the limits of antiaircraft fire are clearly defined, swing-bombing has been used. In this case planes fly toward the target until the perimeter of antiaircraft fire is reached, and, making a banked turn, release their bombs with a centrifugal "throw." The inaccuracy of this method is obvious.

In dive-bombing, the practice of the Japanese is to approach the objective at about 12,000 feet and gradually work down to about 7,000 feet. As the attack develops, the aircraft go into dives of about 60 to 80 degrees with diving flaps lowered. The dives culminate in pull-outs ranging down to 800 feet. As many as 60 to 70 Japanese aircraft have been used in these dive-bombing attacks.

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3. COOPERATION BETWEEN GERMAN RECONNAISSANCE AVIATION AND GROUND FORCES

The article summarized below comes from a handbook that is used in the German Army, especially by officer candidates. It is called "Tactical Handbook for the Troop Commander" and was written by General of Aviation, von Cochenhausen. (See Tactical and Technical Trends No. 7 for previous article taken from this handbook).

The German Air Force is a separate command from the ground forces, but the Germans have worked out a close coordination between the two. The text indicates in general how this has been done.

a. Organization and Command

Air troops are organized into reconnaissance, pursuit, destroyer, and bombardment troops.

(1) Reconnaissance

There are two types of reconnaissance squadrons, those that perform distant air reconnaissance and those that perform close or battle reconnaissance. There are two types of distant reconnaissance squadrons: one type is commanded by a higher headquarters (an army or a group of armies), while the other is directly under the command of the air commander and performs reconnaissance only for the air arm itself. The squadrons for close battle reconnaissance operate under the orders of one of the divisions in the corps. The Panzer divisions have their own air-reconnaissance squadrons attached. To secure cooperation between the ground forces and the air forces, the higher headquarters have an air commander on their staffs, who advises the commanding officer and at the same time is chief of the subordinate air units. When air squadrons are attached to corps or the division, an air liaison detail, commanded by an air liaison officer, is ordered to report to the headquarters of the ground force. This officer is the air adviser in the headquarters staff, but he advises on matters pertaining to the tactical employment of the squadron only as the representative of the squadron commander.

(2) Pursuit

A pursuit group is composed of three squadrons, and three groups form a wing. These planes are used for aerial defense.

(3) Destroyer

A destroyer group is composed of three squadrons, and three groups make a wing. These also are used for aerial defense.

(4) Bombardment

A bombardment group is made up of three squadrons, and three groups make a wing. Dive-bombers are similarly organized. These planes engage enemy ground targets. Pursuit, destroyer, bombardment, and dive-bombing units are under the command of the air headquarters and are not placed under army ground-force control, but in special situations they are instructed to work with army ground-force units.

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b. What the Air Arm Can and Cannot Do

(1) To employ the air arm successfully, one must know what it can and cannot do; its actions are determined by the type of plane, the weather, and the efficiency of the crews.

(2) Knowledge of weather conditions is especially important. The deeper the flight goes into enemy territory, the more a knowledge of the weather becomes necessary. Modern planes can fly through bad-weather areas, but they will not be successful if the weather is bad over the target area. Flying can be hampered by fog, heavy rain, hail, snow, and thick low-hanging clouds. Sun rays are often blinding. Ground haze and heavy moisture prevent planes from finding targets or getting good photographs. Weather conditions are even more important in night flights; a night haze that permits only perpendicular vision is especially dangerous.

c. Basic Rules

(1) Economy

The most important rule in the employment of the air force is the economy of strength. Missions must be limited. A main effort must be established and the air force concentrated on it. Extreme care must be taken in assigning missions.

How often the air force is employed depends upon the situation and upon what the crews have already done. A long flight lasting several hours can usually be made only once a day. A crew can make several short flights in a day if it has already made a survey of the ground.

Pursuit flyers can be employed several times a day. Destroyer or attack crews are limited to one or two flights daily.

Air strength should be conserved especially during quiet periods in the action.

When a mission is given to the air force, clear language must be used, the situation must be outlined, and the missions distinctly explained. Because signals are necessary for success, all the details must be worked out in advance and told to the crews early enough to permit all the men to learn them.

(2) General Considerations

The principle task of reconnaissance aviation is to get information about the enemy, both in the air and on the ground, so that the commanders may understand the situation and make battle decisions.

In addition, reconnaissance aviation explores the terrain. It reports the nature of the ground and vegetation, and the condition of roads, railroads, bridges, rivers, and woods. It furnishes information useful in planning an attack, as well as in checking and correcting maps.

In every flight over friendly terrain, the flyers check on the camouflage of their own troops. They also study the weather.

Reconnaissance crews should not be employed for combat unless necessary, nor for bombardment except in the most critical situations. Reconnaissance planes can carry only limited loads. In small-scale operations they can be used for smoke screens. They should not generally be used for ground strafing. Reconnaissance planes should not seek combat with enemy planes.

The advantages of reconnaissance aviation are its speed and its ability to get beyond the enemy's position; it secures rapidly an extensive view of the enemy and can report its results quickly. On the other hand, air reconnaissance gets only a glimpse; it is almost impossible for planes to make continuous observation of the same area.

Air reconnaissance is done with the eye as well as with the camera. Reconnaissance with the aviator's eyes is the more natural type, and its results can be reported to the ground-force commander at once. But it is limited by visibility conditions, by the height to which enemy guns force the planes, by the success of the enemy's camouflage, and by the abilities of the observer. Planes fly so fast that it is difficult at low altitudes for the observer to recognize certain information or to locate it accurately on the map.

Generally, under average weather conditions, the observer can recognize:

Columns of large units, from a height of 9,000 to 12,000 feet.
Rifle groups, from 3,500 to 4,500 feet.
Individual men, from 2,000 feet.
Firing batteries, from 12,000 feet.
Smoke from railroad trains in open country from 20,000 feet.
Railroad trains without smoke in open country, from 12,000 feet.

Photographs give an accurate representation of the terrain and can be examined in detail. Photographs must be developed, and this causes delay. In urgent cases, partial results in rough work can be reported within 30 minutes after the film is landed or dropped. Otherwise, the time required varies from 2 to 24 hours.

Air reconnaissance by night is limited to what can be seen naturally or with the help of parachute flares. Such flights are most used to get detailed information about some one point, such as a railway station, a main traffic artery, or a crossroads. On the battlefield, night reconnaissance is used to determine the location of hostile artillery flashes and sometimes to discover the enemy's positions of readiness. Crews for night reconnaissance must be carefully selected, and reliable results can be expected only from crews who have already operated over the area by day.

d. Types of Air Reconnaissance

(1) Distant Reconnaissance

Distant air reconnaissance forms the basis for an estimate of the strategic situation. It scouts the entire hostile territory and observes: troop and transport movements behind the enemy's lines, the assembly of large units or their dispersal, the construction of rear defensive positions, changes in traffic, and the location of enemy aviation installations.

Distant reconnaissance is done by the squadrons of the army, army group, or general headquarters. It concentrates on taking pictures at high altitudes (20,000 to 30,000 feet). If the weather prevents flights at high altitudes and the enemy is equipped with antiaircraft artillery, then the mission should be limited to separate but important objectives.

(2) Close Reconnaissance

Close air reconnaissance provides the basic information for accomplishing a mission within a limited area. The limits are determined by the situation, and so are likely to change. The approach of the enemy cuts down the depth of the area, but the nearer the battlefield, the more detailed the reconnaissance must be. When fixing the limits, the marching abilities of the enemy, especially of his motorized forces, must be considered. The reconnaissance should extend far enough ahead to report the approach of motorized forces in good time.

Close reconnaissance observes: assemblies and concentrations of troops, width and depth of the enemy formations, shelters, airfields, supply station, and defensive works. Especial attention should be given to enemy reserves, particularly armored units. If the planes discover armored units approaching the battlefield, they must remain in close contact with them.

Close reconnaissances are made visually and photographically by the corps (or division) squadrons. As fast-moving troops approach the battlefield, visual reconnaissance becomes more important. Altitudes will be determined often by the enemy antiaircraft defense.

(3) Battle Reconnaissance

Battle reconnaissance provides the basis for carrying on the fight. Its extent depends on the combat situation. Battle reconnaissance reports in detail the distribution of the enemy's strength and the progress of the action. It is important, first of all, to determine the assembly areas and movements of the enemy reserves, to observe artillery, and to report promptly all hostile armored units. All action, both friendly and hostile, should be observed.

The results of battle reconnaissance must be reported as soon as possible. The importance of the message will determine whether it is to be reported by radio, dropped message, or in person.

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Planes engaged in battle reconnaissance must always maintain contact with their own troops. This will enable them to identify the front line, to keep contact between the ground troops and their commanders, and to furnish isolated troops with orders, information, and even supplies.

The planes must be able to recognize the friendly ground troops, ground troops are identified by panels. The airplanes request a display of panels by a special light signal, the color of which should be announced to the troop commanders in time for those in the front lines to be able to recognize it. In a like manner, the planes can establish contact with the staffs; staff panels are larger and can also be used to send messages to the planes.

The amount of battle reconnaissance is determined by the situation, and more than the usual amount must be used when tanks are engaged. An enemy tank force must be kept under observation, and the observing planes relieved from time to time so that the watch will be constant.

(4) The Artillery Aviation Service

On the battlefield, one of the most important duties of the air reconnaissance is to cooperate with the artillery. The corps commander will usually assign particular planes to this work. During the battle, the division artillery commander will give his requests directly to the squadron. However, his requests and orders will deal only with artillery matters, for the elements of a reconnaissance squadron must never be subordinated to the next lower headquarters. As much as possible, the direction of the air force must be centered in one person, such as the corps commander.

The missions of the artillery aviation service are: (a) reconnaissance of objectives, and (b) observation of fire. The amount of aviation that can be assigned to this task is limited, and the planes should be given only such missions as cannot be accomplished by the other means of artillery observation.

This reconnaissance should be begun before the battle. The task of the crews is to locate the enemy artillery and to report where and when the enemy's concentrations can be hindered by fire on certain points. Furthermore, the air artillery reconnaissance must study every area in which hostile batteries cannot be definitely located by ground observers, and must help out when ground observation is interrupted by hostile action or change of position.

This type of reconnaissance is much easier when photographs have been taken of the area before the battle. Close cooperation between the squadron and the artillery command is necessary to make good use of the results.

Observation by the air squadron includes observing the effect of single rounds fired while the artillery is adjusting, as well as the effect of the battery fire. The planes only make observations; the battery commander controls the fire.

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e. Cooperation with Motorized Forces

Squadrons that work with motorized forces perform both close reconnaissance and battle reconnaissance.

Close reconnaissance must be made where ground reconnaissance would be too slow. However, air reconnaissance cannot protect advancing mobile troops against surprise. Reconnaissance of the terrain is especially important for armored forces, but reconnaissance from the air can give only a limited amount of information about the suitability of the ground for tank combat. The planes can perform a valuable service by checking the camouflage of friendly troops.

The battle reconnaissance should report, before the tanks begin to attack, whatever can be discovered about the enemy's antitank defenses, such as barriers, and about the positions of the enemy's armored forces. Well-camouflaged antitank defenses are difficult to recognize.

During the tank attack, the battle reconnaissance should watch the movements of friendly armored forces and promptly determine the hostile countermeasures, especially on threatened flanks.

Cooperation between the squadron and an armored division requires close contact between the two commanders. It may even be necessary for the squadron commander to remain on the ground with the division command. It is important to have good signal communications between the ground force command and the squadron's advance landing field. The liaison airplane is most practical for this purpose. The regulation of signals, including radio and dropped messages, requires careful attention because of the speed of the motorized forces. The greatest difficulty comes in getting messages to the assault waves where it is impossible to drop messages and where radio communication is not practicable. The reconnaissance planes can draw attention to areas where threats of danger exist by dropping smoke-signal bombs into those areas.

f. Orders

(1) General

The next higher command gives the mission to the squadron as a whole, while missions to individual planes are ordered by the squadron commander. The air reconnaissance mission should be given in a special paragraph in the operation order; this gives only instructions for the command as a whole and should be supplemented by a special order. The special order must be issued early enough to permit the preparation of the planes and the crews. Hasty preparations endanger success.

The air reconnaissance order must consider the following points: (a) situation, (b) conditions determining the allotment of planes, (c) extent of the area to be reconnoitered, (d) the reconnaissance missions, (e) reporting of information and signal communications, (f) friendly antiaircraft defense, (g) ground organization, (h) information about weather conditions.

The order must give the crew a complete picture of the situation. The extent of the area is determined by the mission, and so must not be rigidly limited.. The main effort of the mission is stated at the place the orders are issued, and individual missions can be given out as the need arises. Specific questions assist the crew in understanding and carrying out its mission.

Orders to photographers must tell the subject of the picture and its purpose, and give instructions about dropping the film and developing the picture. Such missions must take into account the time required and the possibility of delay from the enemy and the weather. The obtaining of photographs to be used by troops cannot be ordered too early. The order should indicate the type of map on which the information is to be reported; also, target squares should be prescribed in order to aid the reporting.

The method for dropping messages should be carefully worked out. A station can be located near certain outstanding landmarks or by means of target designations. The signal which the aviator will use to request permission to drop a message is given in the operation orders so that all ground troops will know it. In reporting by radio, call signals and frequencies are carefully announced, and also the headquarters for which the message is intended as well as those who are supposed to listen in. All interested parties are promptly informed of the recognition signals and code designations.

The allotment of landing fields to the air reconnaissance units is prescribed in a special order issued by the army. In hostile country the assignment of air fields is made by agreement between the air arm commander and the command headquarters.

(2) Operation Orders for the Artillery Aviation Service

These always include: (a) mission, (b) area, (c) objectives (in case a reconnaissance has already been made, the objectives are indicated by numbers), (d) information about the firing batteries (number and type of guns; hours they are ready to fire; situation at the fire position), (e) call signals and frequencies, the dropped-message position, location of the ground radio station, and (f) duration-hour the reconnaissance is to begin, hour fire is to begin, and duration of the fire.

g. Signal Communications and the Reporting of Information

Cooperation between the reconnaissance aviation and the ground-force commander depends upon signal communications, which consist of telephone, radio, liaison plane, and motor vehicles.

The squadron requires telephone communication with its command headquarters; direct telephone connection with next lower headquarters of the ground forces is usually impossible, and for communication with such units motor vehicles or the liaison plane must be used.

The army installs radio communication between its headquarters and the distant-reconnaissance squadron airfield. The corps headquarters installs and operates the ground stations near its headquarters and the stations on the airfield of the close-reconnaissance squadrons. If there is an advance landing field, the ground force operates the ground radio traffic between its headquarters and the landing field, while the squadron operates the remaining ground radio traffic.

The greatest possible use should be made of the liaison plane, because it is free to move and permits rapid communication.

Reports can be made by: (a) air personnel, (b) radio, (c) dropped messages, (d) photographs, and (e) the aviator in person. The type of report to be used must be based on the rule that to be of any value a report must get to headquarters promptly. Normally, reports are made by air personnel after landing, and important reports are transmitted to the ground force headquarters by telephone.

Reports that would be delayed if they went through headquarters are made by radio in plane-to-ground traffic. The aviator on distant reconnaissance calls the airfield ground station, and the army command station listens in. The aviator on close or battle reconnaissance calls the ground force headquarters and the airfield ground station listens in.

Dropped messages are difficult for the enemy to intercept. They are as complete as possible and can be made in several copies at once and dropped on several positions, even to assaulting troops that have no other direct communication with the planes. The ground-force commander indicates the places where dropped messages should fall; whenever possible there should be no woods or water in the vicinity. These positions must not be near command posts or troop assembly areas, since such positions are likely to draw enemy fire. Before dropping a message, the aviators must make sure that the place is free of the enemy. When the plane asks for it, the panel signals will be displayed and then withdrawn after the message is dropped.

In many cases, oral reports delivered by the pilot himself can be most useful to the ground-force commander.

<u>h</u>. <u>Ground Organization</u>

The reconnaissance crews are quartered on field air bases. Upon advancing into hostile territory, the command promptly prepares new bases, which are determined by tactical considerations and by natural camouflage. An attempt is always made to have the air base of the subordinate squadron near the headquarters of its ground-force command. There should be good approach roads, buildings for quarters, and storerooms and workshops, as well as water, light and power facilities, and a railroad connection. Signal communications between the ground-force command and the squadron should be established.

Advance landing fields serve to improve cooperation and should be prepared when the home base is so far from the ground-force command that rapid cooperation is no longer certain.

The change of air bases is determined by the situation. As a rule a change in the ground-force-command headquarters calls for a change in the air base. Also, enemy air attacks can cause a change.

-- (end of translation) --

i. Remarks

German military successes have been due primarily to a superiority in the air and to cooperation among the different arms, especially between the air and ground forces. This text shows that such cooperation is the responsibility of everybody concerned and not only of the higher command. The various German arms work together not by accident but because they are all trained in the fundamentals. Jealousies and rivalries between individuals and units may exist, but these are firmly controlled and not allowed to hinder the united effort. All units and all men are made to realize the important part they play in the team. Credit is given individuals or units for outstanding achievements, but the emphasis is always placed upon what they have contributed to the common cause. Grandstand plays are not allowed.

It is a matter of pride among German commanders to be informed on the characteristics, abilities, limitations, and methods of the arms and weapons with which they cooperate. Every officer must know the basic principles of all the arms. Many of the statements in this text may at first sight seem so obvious that they hardly need stating, yet because the fundamentals of any science are generally simple, the officer acquires from the study of such a text a thorough grounding in the essentials of the science of war. He is then equipped to understand the relation of his particular mission to the larger mission of the whole army. Thus team-work and mutual confidence are achieved.

4. NEW TACTICS--JAPANESE ZERO PLANES

Japanese Zero planes, when encountering our medium bombers, have lately changed their tactics. From a position parallel to our flights but at lower altitude, the Japanese initiate action by climbing turns. They roll out of the attack by a dive to the side opposite to that from which the attack was begun. This is done again and again and is not unlike a lazy eight maneuver.

ANTIAIRCRAFT

5. EMPLOYMENT OF ANTIAIRCRAFT FORCES WITH A GERMAN PANZER DIVISION IN LIBYA

A captured order of the 15th Panzer Division of the Afrika Korps, dated May 25, 1942, affords an interesting example of the division commander's employment of the antiaircraft forces at his disposal.

The order calls for the assembly of the 15th Panzer Division in an area 6 miles north of Rotunda Segnali (northwest of Bir Hacheim) in preparation for an attack. The attack actually began on May 26, and, it may be recalled, was the opening blow in Marshal Rommel's offensive which led to the capture of Tobruk and the Axis advance into Egypt to the El Alamein-Qattara Depression line.

In forming for the attack the 15th Panzer Division occupied a central position, the 90th Light Division being on the right and the 21st Panzer Division on the left.

a. The 15th Panzer Division was organized for the attack as follows:

(1) Armored Group

The attack was headed by one tank battalion, immediately followed by the other tank battalion supported by a company of engineers and a light battalion of field artillery (twelve 105-mm howitzers).

(2) Reconnaissance Group

This group, which was employed to protect the right and open flank of the division's advance, was composed of the antitank battalion and the armored reconnaissance unit.

(3) Support Group

Composed of the medium battalion of the division artillery (twelve 150-mm howitzers) with a battery of 210-mm howitzers attached, the main divisional headquarters with supply and medical units, and the bulk of the engineers, this group advanced immediately behind the tanks.

(4) Infantry Group

Bringing up the rear were the motorized infantry regiment,

supported by the other light battalion of field artillery, and the tank-recovery elements.

b. The antiaircraft forces at the disposal of the division were as follows:

(1) Luftwaffe AA Units (part of the German Air Force)

(a) AA battalion staff.

(b) One heavy AA battery (six 88-mm guns and two 20-mm guns).

(c) One light AA battery (twelve 20-mm guns).

(d) One light AA battery less one platoon (nine 20-mm guns).

(2) Heeresflak Units (part of the Army, or ground forces)

One AA company (12 light guns).

(See this publication No. 7, page 7, for description of the distinction between *Luftwaffe* AA units, the main German antiaircraft arm, and *Heeresflak* units, which belong organically to the ground forces.)

c. These antiaircraft forces were allocated by the division commander as follows:

Unit	Allocated to
(1) AA battalion staff	Staff of 15th Pz Div (in the support group).
(2) Heavy AA battery	Armored group. Prior to the commencement of the operation this heavy battery was ordered to protect the assembly against air attack.
(3) Light AA battery	
(a) Battery staff and 2 platoons (6 light guns)	Field artillery and engineers of the armored group.
(b) One platoon (3 light guns)	Field artillery of the support group.
(c) One platoon (3 light guns)	Heavy AA battery.

(4) Light AA battery less one platoon	
(a) Battery staff and 1 platoon (3 light guns)	AA battalion staff (in the support group).
(b) One platoon (3 light guns)	Engineers of the support group.
(c) One platoon (3 light guns)	Staff of 15th Pz Div.
(5) AA company (12 light guns)	
(a) Company staff and 2 platoons (8 light guns)	Motorized infantry group.
(b) One platoon (4 light guns)	Reconnaissance group.

d. The following points of interest arise from the above dispositions:

(1) Chain of command is from the AA battalion staff (attached to the staff of the division) through the heavy and light battery staffs with the armored group, and the light battery staff with the support group.

(2) The heavy battery is seen in a dual role. In the approach to battle it provides antiaircraft protection, turning to the ground role in support of the tanks when the battle starts.

(3) The light batteries protect the division and AA battalion staffs, the field artillery, the engineers, and the heavy AA battery against low-flying attack. The ground role is secondary.

(4) The AA company gives protection against low-flying attack to the motorized infantry and reconnaissance groups.

(5) The forces mentioned in the orders of the division do not comprise an entire antiaircraft battalion, the missing elements being two heavy batteries and one platoon of a light battery. This is significant as reinforcing the view, based on other information, that a considerable force of heavy antiaircraft guns (no doubt accompanied by a few light guns for close protection) was operating as an independent antitank group.

 [redacted]

6. ANTIAIRCRAFT DEFENSES OF JAPANESE WARSHIPS

Because land-based aviation is being called upon more and more frequently to operate against enemy naval units, information on the antiaircraft armament of Axis warships, as well as the number of planes they normally carry, is of interest to all air personnel. The following tables give the antiaircraft defenses of Japanese warships; those of German warships will be given in the next issue. For explanation of the symbols used in the following tables to designate the type of ship, see this publication, Issue No. 4, p. 25.

The number of light antiaircraft guns listed may not always be accurate, since the number and position of these smaller weapons often vary from week. One of the standard machine guns is the .78-cal weapon, whose characteristics are given on the first table below; and generally, the caliber of weapons in this category is below 40 mm. Some machine guns are mounted for a 360^{o} traverse and elevations up to 90^{o}, while others are more limited.

"X" before a ship designation indicates a converted model, while a prefixed "O" indicates an old model. "VO" stands for observation plane.

CHARACTERISTICS OF JAPANESE NAVAL AA GUNS

	5-in	4.7-in	3-in	.78-in*
Maximum Elevation	85^{o}	85^{o}	85^{o}	
Maximum Horizontal Range	18,000 yds	21,000 yds	9,000 yds	5,470 yds
Maximum Vertical Range	33,000 ft	25,000 ft	20,000 ft	3,289 ft
Muzzle Velocity	3,000 f/s	3,000 f/s	2,300 f/s	--
Weight of Shell	60 lbs	45 lbs	13 lbs	--

*The 20-mm Oerlikon AA machine gun has similar characteristics.

Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
	Kongo Class							
BB1	Kongo	29,330	704	26	8 5-in	Broadside, concentrated amidships in twin mounts	7 MG	3 VO
BB2	Hiyei	29,330	704	18	4 5-in, 4 3-in		7 MG	3 VO
BB3	Kirishima	29,330	704	26	8 5-in		7 MG	3 VO
BB4	Haruna	29,330	704	26	8 5-in		7 MG	3 VO
	Fuso Class							
BB5	Fuso	29,330	673	22 1/2	8 5-in	Two twin mounts are elevated on tower base aft; location of others not indicated.	7 MG	3 VO
BB6	Yamashiro	29,330	673	22 1/2	8 5-in		7 MG	3 VO
	Ise Class							
BB7	Ise	29,990	683	23	8 5-in	Broadside, on either side of foremast and aftermast.	7 MG	3 VO
BB8	Hyuga	29,990	683	23	8 5-in		7 MG	3 VO
	Nagato Class							
BB9	Nagato	32,720	700	26	8 5-in	Broadside, in pairs amidship.	7 MG	3 VO
BB10	Mutu	32,720	700	26	8 5-in		7 MG	3 VO
	Yamato Class							
BB11	Yamato	--	--	--	--	--	--	3 VO
"Pocket Battleships"								
CB1	Kishu	12 to 15,000	--	30	12 5-in (?)	--	--	--
CB2	?	12 to 15,000	--	30	12 5-in	--	--	--
CB3	?	12 to 15,000	--	30	12 5-in	--	--	--
CB4	Chichibu	12 to 15,000	--	30	12 5-in	--	--	--
CB5	"Job 8"	12 to 15,000	--	30	12 5-in	--	--	--
Aircraft Carriers								
CV1	Hosho (Hosyo)	7,470	510	--	2 3-in	--	2 MG	36
CV4	Ryujo (Ryuzyo)	7,100	548	25	12 5-in	--	24 MG	32
CV7	Shokaku (Syokaku)	--	--	--	16 6-in (?)	--	16 20-mm Oerlikon	63
CV8	Zuikaku	17,000 (est.)	800	30	16 5-in	--	16 20-mm Oerlikon	63
CV10	Kasuga	--	--	--	16 5-in (?)	--	--	45
XCV2	Zuiho	--	--	--	4 5-in (?)	--	12 MG (?)	30
	(New Construction)							
CV	Kashiwara	(May possibly be completed and named Junyo.)						60 (?)
CV	Izumo	(May possibly be completed and named Hiyo.)						60 (?)

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Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
Cruisers (Light)								
	Tenryu Class							
CL1	Tenryu	3,230	468	31	1 3-in	On stern.	2 MG	None
CL2	Tatsuta	3,230	468	31	1 3-in	On stern.	2 MG	None
	Kuma Class							
CL3	Kuma	5,100	535	33	3 3-in	Single mounts, one on either side of first stack, one on stern.	2 MG	1 VO
CL4	Tama	5,100	535	33	3 3-in		2 MG	1 VO
CL5	Kitagami	5,100	535	33	3 3-in		2 MG	1 VO
CL6	Kiso	5,100	535	33	3 3-in		2 MG	1 VO
CL7	Oi	5,100	535	33	3 3-in		2 MG	1 VO
	Nagara Class*							
CL8	Nagara	5,170	535	33	3 3-in		6 MG	1 VO
CL9	Natori	5,170	535	33	3 3-in	Probably same as in Kuma Class.	6 MG	1 VO
CL10	Kinu	5,170	535	33	3 3-in		6 MG	1 VO
CL11	Yura	5,170	535	33	3 3-in		6 MG	1 VO
CL12	Isuzo	5,170	535	33	3 3-in		6 MG	1 VO
CL13	Abukuma	5,170	535	33	3 3-in		6 MG	1 VO
	Sendai Class*							
CL15	Sendai	5,195	535	33	3 3-in	One on either side of second funnel; third not indicated (possibly on stern).	6 MG	1 VO
CL16	Jintsu (Zintu)	5,195	535	33	3 3-in		6 MG	1 VO
CL17	Naka	5,195	535	33	3 3-in		6 MG	1 VO
	Katori Class*							
CL18	Katori	--	--	--	2 5-in	--	--	1 VO
CL19	Kashima	--	--	--	2 5-in	--	--	1 VO
CL20	Kashii	--	--	--	2 5-in	--	--	1 VO
	Hirado Class							
OCL1	Hirado	--	--	--	2 3-in	--	2 MG	None
OCL2	Yahagi	--	--	--	2 3-in	--	2 MG	None

*One of these sunk.

Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
Seaplane Carriers								
AV1	Notoro	14,050	470	12	2 3-in	--	--	8 to 16 VO
AV2	Kamoi	17,000	496	15	2 3-in	--	--	10 to 16 VO
AV3	Chitose (Titose)	9,000	577 1/2	20	6 5-in	Mounted in pairs.	20 MG	20 VO
AV4	Chiyoda (Tiyoda)	9,000	577 1/2	20	6 5-in	Mounted in pairs.	20 MG	20 VO
AV6	Nisshin	--	--	--	4 3-in	--	--	14 VO
XAV	Kamikawa Maru	6,853	479	17	2 5-in	--	2 MG	10 VO
XAV	Fujikawa Maru	--	--	--	2 5-in	--	2 MG	10 VO
XAV	Souyou Maru	--	--	--	2 5-in	--	2 MG	10 VO
XAV	Kinugasa Maru	6,808	453 1/2	17	2 5-in	--	2 MG	10 VO
XAV	Kagu Maru	6,807	453 1/2	17	2 5-in	--	2 MG	10 VO
XAV	Kiyozumi Maru	--	--	--	2 5-in	--	2 MG	10 VO
XAV	Goshu Maru	--	--	--	2 5-in	--	2 MG	10 VO
Cruisers (Heavy)								
	Kako Class							
CA1	Hurutaka	7,100	580	33	4 4.7-in	Broadside, amidship in single mounts.	10 MG	2 VO
CA2	Kako	7,100	580	33	4 4.7-in		10 MG	2 VO
CA3	Aoba	7,100	580	33	4 4.7-in		10 MG	2 VO
CA4	Kinugasa	7,100	580	33			10 MG	2 VO
	Nachi Class							
CA5	Nachi (Nati)	10,000	640	33	8 4.7-in	In twin mounts, broadside on either side of funnels.	8 47-mm and 8 MG	4 VO
CA6	Haguro	10,000	640	33	8 4.7-in			4 VO
CA7	Myoko	10,000	640	33	8 4.7-in		--	4 VO
CA8	Ashigara	10,000	640	33	8 4.7-in		--	4 VO
	Takao Class							
CA9	Takao	9,850	650	33	4 4.7-in	Broadside in single mounts.	8 47-mm and 8 MG	4 VO
CA10	Atago	9,850	650	33	4 4.7-in			4 VO
CA11	Chokai	9,850	650	33	4 4-7-in		--	4 VO
CA12	Maya	9,850	650	33	4 4.7-in		--	4 VO
	Mogami Class							
CA15	Suauya	8,500	639	33	8 5-in	The 5-in guns are in twin mounts on either side of the funnel.	12 MG	4 VO
CA16	Kumano	8,500	639	33	4 3-in		12 MG	4 VO
Coast Defense Ships (Old Heavy Cruisers)								
OCA1	Asama	--	--	--	1 3-in	--	--	--
OCA2	Yakumo	8,640	434	16	1 3-in	--	3 MG	--
OCA3	Azuma (Aduma)	8,640	452 1/2	21	1 3-in	--	3 MG	1 VO
OCA4	Izumo (Idumo)	9,180	434	16	1 3-in	--	3 MG	1 VO
OCA5	Iwate	9,180	434	16	1 3-in	--	3 MG	1 VO
OCA6	Kasuga	7,080	357	20	1 3-in	--	2 MG	--

7. REMOTE CONTROL DEVICE FOR ANTITANK GUNS

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The British have for some time recognized the limitations of voice control of antitank fire during the din of a modern battle. The disadvantages are:

(a) Orders may not be heard at all.

(b) Orders may not be understood, resulting in delay and perhaps confusion when repeated.

(c) Orders may be misunderstood and wrong data applied to sights.

(d) In any chain of precision operations, the more minds under stress, the more chance of error.

In certain of their antitank guns, the NCO observing the bursts himself applies range corrections to the sight, and, while leaning over the gunner to do so, shouts deflection (or lead) corrections in his ear. This method of fire control is satisfactory when there is no dust. The gunner has only two things on his mind - the target and the lead - and need never lose sight of his target.

Dust stirred up by muzzle blast, however, has proved a great hindrance to good fire control during direct fire at moving tanks. Modern high velocities and muzzle brakes have aggravated this handicap, and it is often necessary for the chief of section (or other officer or NCO observing) to move to the windward flank in order to observe the bursts.

Several disadvantages are at once introduced by such a procedure:

(a) Voice control is necessary for both direction and range correction.

(b) The spotter is removed to a greater distance, thereby greatly increasing all the inherent disadvantages of voice control.

(c) Either the gunner must put on range corrections, taking his eyes and mind off the moving target, or a third gun-crew member is necessary.

(d) The spotter has a tendancy to turn towards the gun while giving orders, taking his eyes off the target.

With a view to overcoming these difficulties, the British have recently conducted experimental tests with an improvised remote-control device for antitank firing attached to a 25-pounder (3.45-in) field gun. The observer (chief of section) was posted 4 yards to the windward flank. By means of a small apparatus having two small wheels, one for direction corrections and one for range corrections, and each connected to the appropriate components of the sight by a flexible cable, he was able to apply the desired corrections, leaving the gunner free to concentrate on following his target.

Despite the fact that the experimental equipment was rather crude, inasmuch as it had been made in one day, the experiment was a success, and

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there was no necessity for any shouting of orders. The British are now proceeding with the development of this remote-control apparatus.

8. PENETRATION OF GERMAN 88-MM ANTITANK GUN

The following penetration figures for the German 88-mm dual-purpose gun, using armor-piercing shell against armor and concrete, have been obtained from a captured German document. Angle of attack is given as 70 degrees. The quality of armor attacked is not stated, but it is believed to be of standard German specifications:

Range in Meters	Thickness of Armor (mm)	Thickness of Concrete (mm)
500 (547 yds)	71 (2.0 in)	1,100 (43.31 in)
1,000 (1,094 yds)	67 (2.64 in)	1,000 (39.37 in)
1,500 (1,640 yds)	65 (2,156 in)	900 (35.43 in)
2,000 (2,187 yds)	63 (2.48 in)	800 (31.50 in)

9. RUSSIAN 76.2-MM GUN

It has now been established that the Germans are using the Russian 76.2-mm field gun, model 36, as an antitank weapon in Egypt.

It has also been reliably reported that there is a self-propelled mounting for the weapon, although prisoners state that the first mount has not proved satisfactory.

German AP projectiles with Russian cases have been used, but in the case of HE, the complete Russian round is used.

The muzzle velocity, with a 14.33-lb. shell, is estimated at 2,316 feet per second. The estimated penetration of AP shot against homo plate is shown in the following table:

Range (yds)	Penetration at 90° (in)	Penetration at 60° (in)
0	4.69	3.62
250	4.47	3.47
500	4.23	3.31

750	4.10	3.15
1,000	3.92	2.99
1,250	3.74	2.86
1,500	3.57	2.70
1,750	3.39	2.56
2,000	3.21	2.42

Penetration at 90° may be slightly over-estimated.

Higher-velocity ammunition is provided in the AP-40 projectile, which weighs 9.25 lbs. This is a converted HE projectile with a tungsten carbide core weighing 902.5 grams (1.9 lbs). It has not been found possible to deduce an exact muzzle velocity owing to the exceptionally high density of loading, and the low temperature of the propellant. It is believed, however, that it is probably between 2,800 and 3,000 feet per second. It may be has high as an unconfirmed figure of 3,428 feet per second. The following figures give estimated penetration for the 3,000-feet-per-second muzzle velocity, firing against homo plate at a 60° angle.

Range (yds)	Penetration (in)
0	4.39
250	4.00
500	3.64
750	3.33
1,000	3.01
1,250	2.72
1,500	2.44
1,750	2.21
2,000	1.97

The weapon itself is a field gun of split-trail design; it can also be used for antiaircraft barrage fire. The vertical sliding breech block is semi-automatic. Metal wheels with solid rubber tires are used.

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Other characteristics of the gun are:

Maximum range	15,260 yds
Caliber	76.2 mm (3.00 in)
Length of barrel	50 calibers
Trunnion height	40.75 in
Track	64.57 in
Elevation	-5° to $+75^{\circ}$
Traverse	30° each way
Length of recoil (controlled)	38.19 to 21.65 in
Buffer liquid	5 quarts
Recuperator liquid	5.9 - 6.1 quarts
Compressed air	27 - 30 atmospheres
Shield thickness	.157 in
Weight of piece (with breech block)	990 lbs
Weight in action	1.78 tons

The gun is equipped with rocking-bar reciprocating sights. The elevation indicator is graduated in meters for the three types of projectile, and in mils up to 800 (45°). The range indicator fitted to the gun examined was German. Clinometers would presumably be necessary for antiaircraft barrage fire.

Ammunition is of the following three types:

AP 39; range 6,000 meters (6,540 yds)

AP 40; range 2,000 meters (2,180 yds)

HE; range 1,400 meters (15,260 yds)

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10. NOTES ON BRITISH ARTILLERY IN THE BURMA CAMPAIGN

Like much information on tactics and the performance of equipment in the Burma campaign, these notes on artillery consist simply of comments made by British officers who participated.

The standard British field-piece, the 25-pounder (88-mm) gun-howitzer, is not suited for jungle warfare; although in all other theaters it proved to be an excellent weapon. Medium and heavy mortars and light and heavy howitzers are much more satisfactory for this type of campaign. One officer recommended that, rather than the present organic division artillery of three regiments of 25-pounders, a division participating in such a campaign should have one regiment of pack howitzers and one battalion of 25-pounders.

The Japanese used their infantry howitzer in the campaign, and although this is an effective gun, it was handled poorly in this fighting. For example, the Japanese would often adjust and then fail to fire for effect. They also seemed to fire a great deal at random.

For firing, the British had to use a 1:63,360 map. While not entirely satisfactory, it was found that the map could be used to give better than fair results. The pack howitzers which were used were extremely effective and entirely satisfactory. One regiment, using the 3.7-inch medium howitzer broken up into 8 loads, fought and marched 1,300 miles from the 1st of February to the 20th of May and gave an extremely good account of itself. The following reasons were given for this: (a) The enlisted man was an excellent type of Indian soldier; (b) the training of this artillery, which had taken place on the northwest Indian frontier, insured a larger amount of peacetime action and marching in rough country; (c) The officers had often been sent on isolated missions with small units and were well-trained and competent; (d) the mule required no gasoline and could live almost entirely off the countryside.

It was found that the wire supply of 16 miles per artillery battalion was inadequate.

One light machine gun for each battery was provided, but the latest opinion was that four per battery were needed. Here, as in all campaigns, it was once more demonstrated that troops must be trained in each others jobs, for when casualties come, this is one of the most difficult problems which a battery or even a gun crew must face. In the case of units where this training had been insufficiently stressed, the period of reorganizing and providing the necessary minimum training was far too long.

A small car, such as the jeep, was unanimously desired by all officers and men. Many of the trucks used were too unwieldy and unmaneuverable. Some officers recommended that at least one per battery be assigned as a reconnaissance vehicle, and that it also be utilized as a prime mover for the 2-pounder antitank gun, 3.7-inch howitzer, and 40-mm Bofors.

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The British officers felt that distribution of ammunition should be based on 85% HE, 10% shrapnel and case shot, and about 5% smoke.

11. GERMAN 150-MM SELF-PROPELLED GUN

Reports from the Middle East indicate that the Germans are using, in addition to the 75-mm assault gun (see issue Number 7, page 9), a 150-mm self-propelled gun on a Mark II chassis. Previous reports indicate that an earlier version of this self-propelled artillery consisted of the same gun on a Mark I chassis, but it seems probable that this mount was not satisfactory.

The gun itself is the regular 150-mm heavy infantry howitzer, firing an 80-lb shell a maximum range of 6,000 yards. The elevation and traverse for such a mounting are not known.

The armor of the Mark II chassis was formerly about 15-mm., but it is very possible that, plates of 15 to 20-mm have been used to reinforce the front. Details of the armor protection for the gun and its crew are not known. Maximum speed on roads is probably about 24 miles per hour.

12. NEW GERMAN BOMBTHROWER

The Germans are apparently developing, and to some extent using, a device for projecting large HE or incendiary bombs. The weapon is known as the Schwere Wurfgerät or "heavy throwing apparatus". There are three different types of this weapon, although the projectiles are the same in all cases.

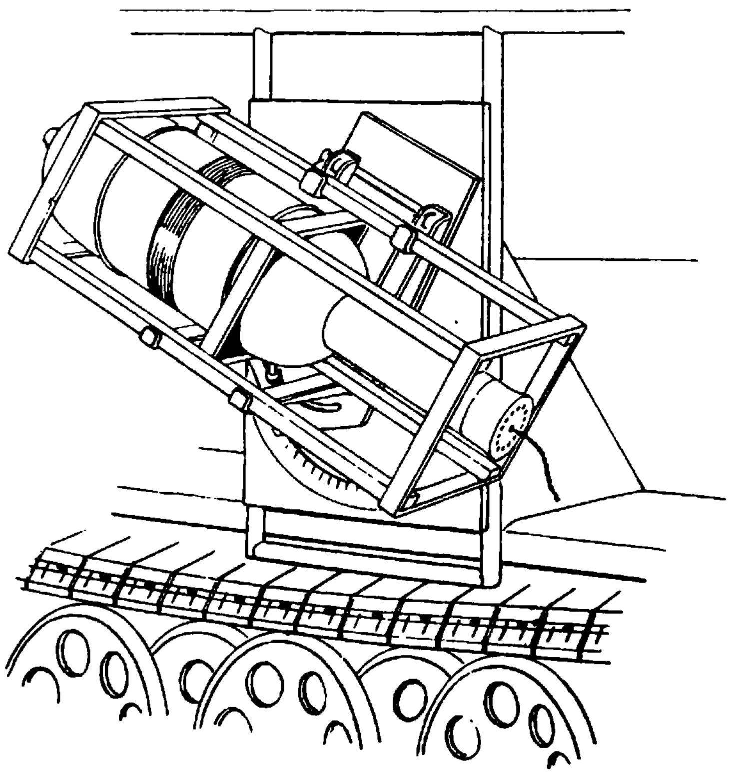
The first type is known as the Schwere Wurfgerät 40 (s. W.G. 40), in which the stand is a wooden ramp, which is transported to the firing position and then dismounted and prepared for action.

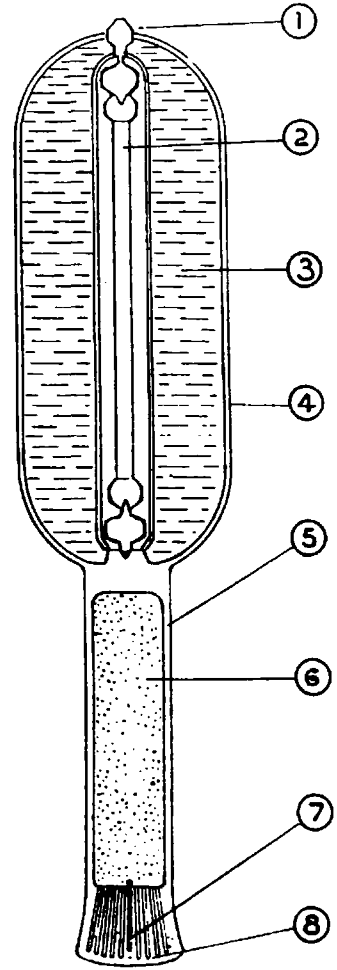
The second type, the Schwere Wurfgerät 41 (s.W.G. 41), is similar to the model 40, except that the stand is made of metal.

The third type consists of the model 40 mounted on a medium, armored, half-track vehicle (see accompanying sketch).

This vehicle is normally used as an armored troop carrier with a complement of 10 men, and is fitted with swivel mountings at the front and rear for model-34 machine guns. It seems probable, however, that in some of these vehicles, the forward machine gun and mounting is replaced by a 20-mm gun for defense against light armored vehicles.

s. WURFGERAT 40
PROJECTOR & AMMUNITION





The characteristics of the half-track vehicle are as follows:

Weight (empty) about	7 tons
Weight (loaded) about	8 1/2 tons
Overall length	5.8 m. (19 ft. 0 in)
Overall width	2.1 m. (6 ft. 11 in)
Overall height	2.1 m. (6 ft. 11 in)
Thickness of armor	10 to 15 mm. (0.4 to 0.6 in)
Turning radius	13.5 m. (44 ft)

Each projector consists of two parts: carrier plates on the side of the vehicle, and a skeleton framework to hold the bomb.

The carrier plates are pivotally mounted so that they can be elevated from 5 to 42 degrees, and are each provided with a clamping lever and an elevation scale. The projectiles are transported in, and fired from, the framework.

It is now known that the projectiles are of rocket type and are fired electrically.

The weight of the HE projectile is 181 lbs, and of the incendiary, 174 lbs The HE projectile has a main filling of 110 lbs of TNT, while the incendiary contains 13 gallons of oil.

A pink band approximately 1 1/4 in wide distinguishes the HE projectile from the incendiary, which has a green and yellow band.

The following details of the projectile may contain minor inaccuracies but are believed to be generally correct (the numbers refer to parts shown in sketch):

(1) Artillery-type, direct-action, nose fuse.
(2) Instantaneous detonating system
(3) Main filling.
(4) Casing wall 3-mm (1/8 in) thick.
(5) Tail body.
(6) Propellant charge (diethylene glycol dinitrate).
(7) Socket for electric primer.
(8) Nozzle apertures.

13. ARTILLERY WITH A GERMAN TANK DIVISION

The following is a digest of an article written in the Red Star (Moscow) on the use of artillery in a German tank division during attack. It is interesting in that it describes the composition of march columns and attack formations, in addition to discussing tactical employment.

The organic artillery with a German tank division, as used against the Russians on the Eastern Front, normally consists of two 105-mm battalions and one 150-mm howitzer battalion, and is usually reinforced by one or two battalions of light artillery.

On the march, the commanding officers of the artillery regiments, battalions, and batteries, plus a minimum of their respective staffs and control units, march at the head of the column. The artillery reconnaissance party marches with the tank reconnaissance unit. Battery reconnaissance parties consist of two armored cars and two motorcycles. In case one of the cars is destroyed the other can carry on the vital reconnaissance work.

Artillery observers ride in armored cars which are armed with machine guns. In each car there is an observer, the observer's assistant, a radio operator, and a driver. There are two such observation vehicles per battery. The battery commander rides in one and another officer in the other. The battalion has three such observers' cars.

Planes are assigned to work with the artillery of the division and are subject to call by the commanding officer of the artillery who assigns through battalion one plane or more per battery, depending upon the amount of planes available. In the attack, one light artillery battalion normally supports one tank regiment in direct support and the medium battalion is in general support. But in the majority of cases experienced, the artillery of the tank divisions has been reinforced so that two light battalions can be assigned to a regiment in the first echelon, which allows one light battalion per tank battalion. One battery of each battalion supports the right element of a tank battalion, another the left element, while the third is echeloned to the rear and is charged with security of the flanks and rear.

Observation posts, command posts, and battery positions are all moved as far forward as possible. Batteries fire from concealed positions, as a rule.

Preceding an attack, preparation fire is conducted from 15 minutes to 1 hour on enemy artillery and tank assembly areas, and observation points are smoked, Enemy front-line infantry is generally disregarded during the preparation, as their neutralization is left to the tanks. Direct-support battalions do not always participate in the preparation fire, but are put in march order with full supplies of ammunition, ready to jump off with the tanks.

The battalion commanders and battery commanders of direct-support units remain at their observation posts in an attack until the head tank passes their line, at which time they take up their positions in the attack echelons. The German general-support artillery does not change its position in an attack which is designed to go no further than the enemy artillery positions. However, in an attack which is intended to penetrate beyond enemy artillery positions, they do move forward when practicable. If the German infantry lags and is finally held up, but the tanks break through and continue forward, the general-support

artillery does not move forward.

During the German break-through at the end of October 1941, from the city of Orel in the direction of Mtsensk, German tank units succeeded in breaking through the Soviet infantry lines, but the German infantry supporting the tanks was cut off and forced to dig in. The support artillery could not move forward and, as a result, the tanks, having no support from their artillery, were compelled, after suffering heavy losses, to return to their original positions.

Comment

The above discussion confirms well-known German tactics. It is important, regardless of the success of the enemy tanks in a break-through, to stop the infantry moving up in support of the tanks because the artillery is therefore prevented from advancing and the tanks are deprived of their direct support. The tanks can then be much more easily dealt with.

CAVALRY

14. CAVALRY COMBAT AT NIGHT

This report is a translation of an article, "Night Combat by Cavalry," by a Russian cavalry officer, describing Soviet tactics in cavalry night operations generally. As a specific example it describes the capture of a village.

"Before the war began many of our people were opposed to the creation of large masses of cavalry. They were motivated by the fact that since modern war was one of motors, the use of cavalry was limited. This thought has become increasingly prevalent since the beginning of the war, at the outset of which, the Germans were successful. It was said that effective use of cavalry against enemy tanks and mechanized units supported by aviation was impossible.

"When the German onslaught was at its peak, however, Belov's cavalry corps demonstrated many times that cavalry could operate successfully against tanks and mechanized forces. Without even mentioning the numerous raids in the enemy rear performed by our cavalry, it is now proved that cavalry has its place and can accomplish a wide range of missions. At Rostov, the Don and Kuban cavalry were of inestimable value in aiding the troops on the southern front. There, Belov's Guard Corps was pitted against Guderian, whom the Germans called 'the Invincible'. But when the engagement was over, Guderian's 2nd Motorized Division and 17th Tank Division were forced to withdraw with great losses.

"The employment of cavalry against tanks is a difficult operation which is aggravated by constant aerial threats. But by making use of all the modern weapons cavalry can accomplish its mission.

"There are now two principal characteristics of cavalry tactics: first, operations are conducted at night to avoid losses from the air; second, cavalry attacks are made dismounted. The mobility of cavalry, and its ability to appear suddenly on the flanks and in the enemy rear and disappear just as suddenly, can all be accomplished by night action and affords a great tactical advantage. Cavalry is distinguished by the suddenness of its attacks, and operates most successfully at night.

"The success of a night attack depends greatly on careful reconnaissance of the enemy dispositions. A commander's reconnaissance includes the approaches to the position, and the location of firing positions and outposts. While it is still light, all measures are taken to provide absolute concealment and correct orientation. The plan of every assault group is worked out in detail as to which units will actually seize outposts and sentries, and which will deal with the automatic riflemen, the machine guns, and the tank crews at the moment they come out of bivouac. This is essential.

"Such a plan for the attack is accomplished without firing a shot, unless the Germans open fire, in which case all our fire power is brought into action.

"Experience has shown that it is difficult for cavalry to use artillery for offensive purposes in night operations. Therefore, we use it principally in defensive night operations. Normally, the regiments and squadrons are accompanied by their heavy machine-gun carts. Experience has shown that these weapons are sufficient to accomplish the mission. Antitank units are equipped with antitank weapons, grenades, and bottles of gasoline.

"All individual and horse equipment is carefully inspected. Stirrups are wrapped in felt or straw. About 5 to 8 kilometers from the enemy we leave the machine gun carts in the open and carry the guns and mortars in pack. The troops dismount against in open areas not far from the enemy outposts, and the horseholders conceal the horses. From this point on, the action is dismounted.

"All supporting weapons are so placed as to provide fire for the withdrawal of the units when they have accomplished their mission. If the mission is to seize a particular point, the machine guns and mortars give continuous support. In a case where the mission is to destroy an enemy unit, the troops return when the mission has been accomplished. Therefore, our night attacks are planned so as to be completed and still leave 2 or 3 hours of darkness to permit withdrawal to our own positions without sustaining air attacks.

"The following is a typical example of cavalry night operations against a village. Two days were required to prepare this attack. The village was 22 kilometers from our division position. A troop had been sent out on reconnaissance. It concealed itself in the forest, from where it observed road movements, and determined the enemy strength and location of outposts, tank parks and night bivouacs of crews, as well as of the headquarters and rear elements.

"The approaches to the town were important. West and south were two ravines inaccessible to tanks. The decision was to attack from the north and east. Attack from these directions would permit cutting off any attempt of the Germans to withdraw along the highway which ran north of the city. It would catch the enemy under crossfire and at the same time avoid the danger of firing on our own troops. Since one regiment attacked from north to south and the other from east to west, this danger was averted.

"The division moved out in 2 columns at 1900 hours, and at midnight it had assembled 3 kilometers from the town, where it dismounted at once and went into action. In order to insure surprise, the attack was made without signaling. The outposts were jumped without noise, and the units moved into the town to the bridge. Here 3 German guards opened fire, but it was too late. By this time, our troops had thrown grenades into the houses occupied for quarters, the assault groups had attacked the firing positions, and 15 tanks had been put out of action. The remaining tanks moved to the highway, but our pioneer units had blown up the bridge. The fight ended at 0500 hours, and before daylight (about 0800 hours in December) the troops had returned to their positions unnoticed by enemy aircraft.

"As a result of such attacks, the Germans are now posting strong outposts, and even more careful reconnaissance is required."

15. GERMAN ARMY FORM FOR REPORT ON ENEMY USE OF GAS

While there has apparently been no extensive use of gas in the present war, its employment is an ever-present possibility. If gas is used by the enemy, it will be essential to get complete and accurate information back to higher headquarters without delay. In this connection, the following translation of a Germany Army form is of interest. The form is typically German in its thoroughness. The reference to horse casualties should be noted, bearing in mind that a large proportion of the transport in German nonmotorized divisions is horsedrawn.

The translation follows:

REPORT ON ENEMY USE OF GAS

a. Use

Method employed (bombardment, gas mine, projector, shell, cloud attack, spray from vehicles, spray from aircraft).

Day: Began: Finished:

Interruptions:

Area concerned (with map or sketch):

Supposed military object of attack:

Units concerned:

Kind of ground and vegetation:

Weather:

In the case of shell:

Approximate no. of shells:

Proportion of HE (%):

Caliber:

Rate of fire (rpm):

Proportion of duds (%):

Markings:

Visibility of gas on detonation of shell:

Noise on detonation:

Disintegration of projectile:

b. Effects

Smell of gas:

Approximate strength of troops exposed to attack:

Number of gas casualties:

Apparent severity of gas injuries:

Immediate death rate:

Death rate at battalion aid station:

Death rate in other medicalunit.

Number of horse casualties:

Number of dead or slaughtered horses:

Effects of Gas on:

Eyes:

Throat:

Nose:

Breathing passages:

Digestive organs:

Skin:

Animals:

Weapons:

Clothing, equipment, saddlery:

Vegetation:

c. Gas Defense

Arrangements:

Protective equipment used:

Time and result of using equipment:

Did the prompt wearing of the gas mask afford protection?

Results from gas identification set:

Supposed causes of casualties in personnel and animals:

In the case of ground contamination:

Did the troops recognize the gas immediately?

By what characteristic?

Countermeasures taken:

Behavior of the detector powder:

Gas containers found:

Description:

Were specimens taken?

Was the gas liquid or solid?

Field-laboratory research results:

Is the gas a known one?

Nature of ground decontamination:

Special observations on decontamination (e.g., did the gas inflame?):

d. Other Observations

16. GERMAN MARKING OF ANTITANK MINE FIELDS

The following excerpts are taken from an order issued by the 90th Light Division in Libya on April 24, a short time before the start of the Axis offensive.

"Renewed accidents have shown that measures for the fencing of mine fields are still inadequate. In the future, strong wire fences 1 meter high, or stone walls at least 40 cm high, will be built. If shortage of men and material make it impossible to complete this work immediately, mines already laid will be secured or removed. All available substitute materials, such as barrels, concertina wire, tin cans, derelict vehicles, etc., will be used to mark mine fields. If engineers are not available, the work will be carried out by other arms.

"When a mine field is laid, the engineer unit will deliver to the commander of the sector or strongpoint a 1:25,000 map of the mine field. The removal of mines must likewise be reported to the sector or strongpoint commander.

"The sector or strongpoint commander is responsible for guarding the mine field and for traffic control in its vicinity. Both he and the troops under his command must know the exact location of the mines."

INFANTRY

17. NOTES ON AXIS PARACHUTE TROOPS

a. Germany

The following information concerning the organization of the German parachute battalion has been learned from prisoners recently captured in North Africa.

The battalion is composed of 3 rifle companies and 1 heavy company, each of a strength of 180 men, a signal platoon of 45 men, and an engineer platoon of 30 men.

Each company consists of 3 platoons of about 45 men each, and each of these platoons in turn is composed of 3 rifle squads and a light mortar squad.

Certain details of the armament and equipment of the battalion are also of interest. Each rifle squad is armed with 2 light machine guns, and 1 company has a squad equipped with 2 heavy machine guns, as well as antiaircraft and antitank guns. In action each man is equipped with from 10 to 15 hand grenades. In addition, approximately one-fourth of the riflemen are armed with a rifle-grenade attachment and 6 rifle grenades.

b. Italy

While thus far there have been no reports of the employment of Italian parachute troops in any theater of operations, it is known that the Italians have recently been stressing this aspect of modern warfare in their training programs. The following details, also learned from captured prisoners, concerning the equipment and training of Italian parachutists are of interest.

(1) At the time of junping, each parachutist is equipped with the following: a Beretta machine carbine strapped to his right leg, 400 rounds of ammunition, a haversack containing 40 grenades, 3 days' hard rations, and 1 quart of water.

(2) Guns and ammunition are dropped in sacks by blue parachutes. For the purpose of easier identification, these sacks are marked with certain distinguishing symbols. Thus the sack containing the gun barrel is marked with a yellow flag, that containing the wheels and trail with a blue circle, and that containing the carriage with a black circle. The ammunition is dropped in a sack marked with a red circle.

(3) In the training of Italian parachutists, jumps are never made below an altitude of 300 feet. A feature of the training is the emphasis on speed in unloading a plane, and the jumping schedule calls for seven men jumping in an interval as small as 4 seconds.

c. Japan

Details are now available on the effective part played by Japanese parachute troops in support of sea-borne landings on Timor.

Paratroops were employed on 2 successive days during sea-borne landings, with the object of cutting lines of communication. A parachute battalion of 700 men was dropped--350 on each day.

Landings were made at about 0830 hours in bright sunlight with no wind. The country was relatively flat and timbered (varying from thick undergrowth to high palm trees 15 to 20 feet apart). Each day the principal landings were made about 5 miles from the fixed defenses and astride lines of communication Paratroops were transported in carrier planes, each holding 15 to 24 men. Protection was given by fighters and bombers, the latter in flights of 9 in arrow formation. During the actual landing the supporting planes machine-gunned and bombed places nearby.

Paratroops were released in groups of six to eight men from a height of 300 feet. Squad leaders came down in blue parachutes and platoon leaders in red. During the operations parachute troops wore rubber boots and green uniforms buttoned at the neck. They carried compasses strapped to the wrist, and were armed with Tommy guns, which were fired during the descent. Their equipment included small mortars and a liberal number of radio sets with batteries. Emergency rations wrapped in cellulose consisted of rice and compressed fish. There was no evidence that special containers for arms and

supplies were dropped.

The Japanese were well trained. Unlike the paratroop attack on Palembang the operations at Timor were undoubtedly successful. In one instance they landed within 1 1/2 miles of a company position, and on another occation surrounded a battalion and prevented it from breaking through. On the other hand, at no time was there any air opposition, so that landings were made close to the scene of operations, and escorting planes were left free to bomb and machine-gun the area.

18. JAPANESE MACHINE GUNS

In all their campaigns in the Far East, particularly in the close-in fighting of the jungle, the Japanese have relied heavily on the automatic fire of their light and heavy machine guns. The following table gives available figures on the performance of these guns. Types 92 and 96 are the latest.

Type	Total Weight	Weight without Mounting	Maximum Range	Effective Range	Length Over-all	Length of Barrel
6.5-mm LMG "Taisho 11" (1922 Model) (Nambu)	22.4 lbs	---	---	---	43.5 in	19.1 in
6.5-mm LMG "Type 96" (1936 Model)	---	Without magazine or telescope, 19.14 lbs	1,640 yds	---	41.26 in	21.65 in
6.5-mm Hv MG "Taisho 3" (1914 Model)	127 lbs	67 lbs	2,400 yds	---	---	---
7.7-mm Hv MG "Type 92" (1932 Model)	122.1 lbs	61.6 lbs	2,952 yds	875 yds	43 in	25 in
12.7-mm Hv MG "Arisaka 90" (1930 Model)	187.3 lbs	88.1 lbs	3,280 yds	---	---	---

Type	Max. Rate of fire	Practical rate of fire	Type of feed	Magazine or belt capacity	Remarks
6.5-mm LMG "Taisho 11" (1922 Model) (Nambu)	800 rpm	---	Hopper and clips	Hopper contains 6 clips of 5 rds each	Gas-operated; fitted with bipod, tripod occasionally used.
6.5-mm LMG "Type 96" (1936 Model)	550 rpm	---	Magazine	30 rds	Gas-operated; bipod mounting; also used for AA fire; a bayonet can be fixed.
6.5-mm Hv MG "Taisho 3" (1914 Model)	400 rpm	---	Strip	30 rds	Gas-operated; tripod mounting; Hotchkiss (1914) model.
7.7-mm Hv MG "Type 92" (1932 Model)	500 rpm	---	Strip	32 rds	The standard Hv MG; gas-operated; tripod mounting.
12.7-mm Hv MG "Arisaka 90" (1930 Model)	400 to 500 rpm	---	Drum or belt	Drum 25 rds belt 250 rds	Tripod mounting.

 [redacted]

19. GERMAN COAXIAL SIGHTING TELESCOPE

The examination of a German sighting telescope TZF 5b manufactured by L. Leitz, Etzlar, and taken from a German Mark IV tank, where it was used for the coaxially mounted 75-mm gun and the 7.92-mm machine gun 34, revealed the following particulars:

a. Dimensions

Length	32 in
Weight	25 lbs
Diameter of objective (mounted)	23 mm
Diameter of eye-lens (mounted)	48 mm
Maximum elevation of telescope	$+36^{\circ}$
Maximum depression of telescope	-22°

b. Optical Constants

Diameter of effective aperture of objective	14.5 mm
Diameter of exit pupil	6.0 mm
Magnification	2.4 times
Field of view (angular extent)	23.5°
Apparent field (field x power)	56°
Eye relief (1) mechanical	21 mm
(2) optical	30 mm
Plane of entrance pupil	48 mm
Axial light transmission	20.1%
"Veiling glare" index	14.5

"Eye relief" refers to the distance between the eyepoint and (a) the eyepiece mount (mechanical) or (b) the eye-lens (optical).

The "veiling-glare index" is a measure of the amount of scattering of the light in its passage through the telescope, (in other words, the loss of contrast in the image) and is a function of the optical design and the cleanliness of the glass surfaces. A clean binocular usually has a value between 1 and 2,

while a value of 5 gives a noticeably misty appearance. It is probable that the high veiling-glare index of this telescope is inherent in the optical design, involving as it does some 30 air-glass surfaces.

c. Optical Performance

The captured sight was tested for optical performance with the following results:

With focus adjusted to give the best possible performance at the center of the field of view, definition was good over an angular field of 8 degrees and fair over a field of 15 degrees. Definition near the margin was poor. Eye freedom was found to be good, and correction for color, curvature, and astigmatism, satisfactory.

d. General Construction

The telescope, which is of the fixed eye-piece type, consists of three main parts:

(1) Part one, (which moves with the gun) includes the objective (with protecting glass), the graticule, and a single-reflecting prism. The objective is arranged in a tube (6A) (see accompanying sketches for numbered references hereinafter) mounted on the front half of the graticule box (4A), and the prism in a casing behind the graticule box.

(2) Part two includes the eye-piece and a second single-reflecting prism, which are mounted in a stationary eye-piece tube (2A) fixed to the turret of the tank.

(3) Part three includes a double reflecting prism, which is arranged in an offset box (3A), and connects the optical systems of parts one and two. The optical and mechanical hinge of the telescope is located at this part.

e. Optical Hinge

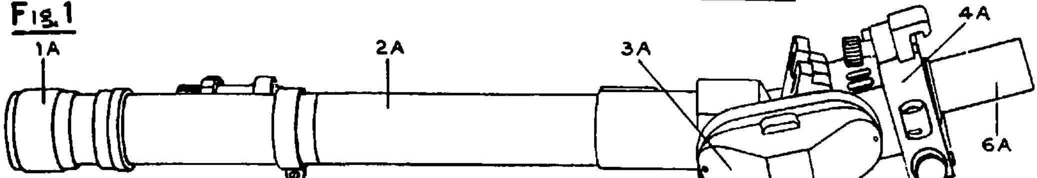
The single reflecting prisms on the pivoting ends of parts one and two transmit the line of vision to and from the respective reflecting surfaces of the double reflecting prism, through hollow tubes which form the bearings of the mechanical hinge mechanism.

f. Mechanical Hinge

The mechanical link between parts one and two is formed by a small, flat, steel plate pierced near each end by two large circular holes. Short tubes projecting at right angles on the fixed and moving sections engage with these holes, and form two bearings, allowing the sections to move in a vertical plane relative to each other.

German Sighting Telescope. T.Z.F. 5.B.

Fig. 1



OFFSIDE VIEW

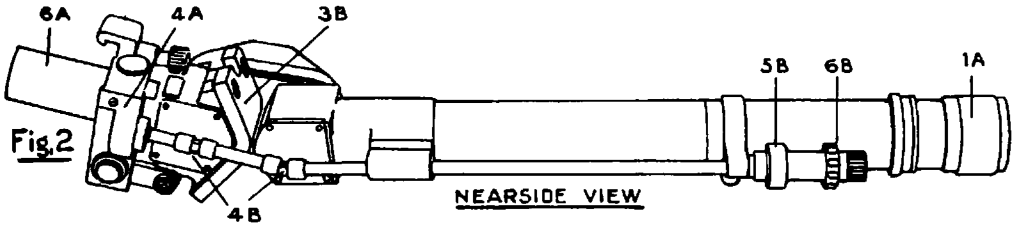


Fig. 2

NEARSIDE VIEW

Fig. 3

ENLARGED VIEW OF GRATICULE

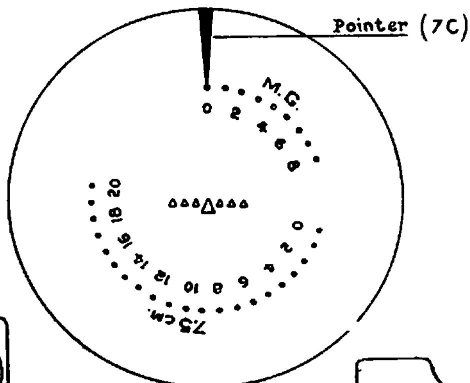
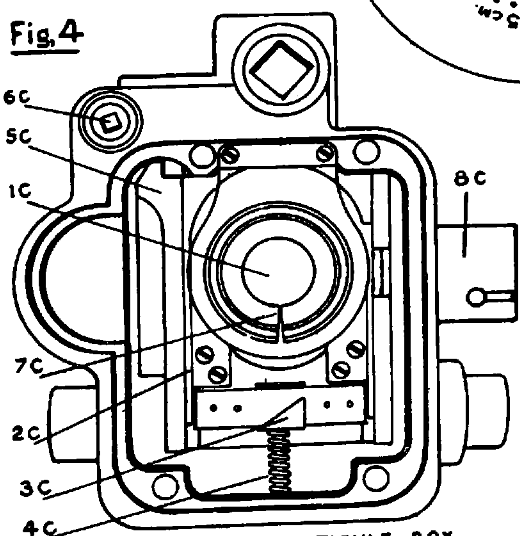
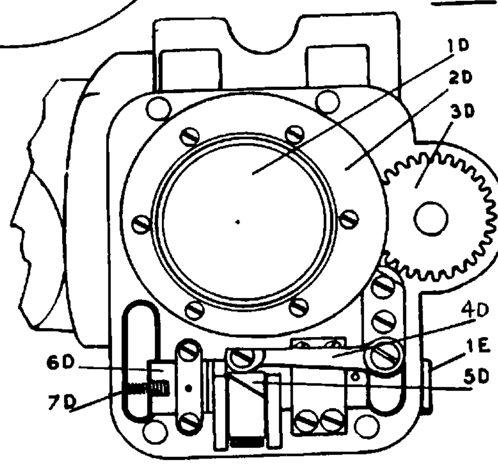


Fig. 4



FRONT HALF OF GRATICULE BOX

Fig. 5



REAR HALF OF GRATICULE BOX

[redacted]

Gears fixed to each short tube mesh beneath the plate and equalize the movement at each bearing point, thus forming a virtual hinge midway between the two bearings. These bearings are adjustable by tapered, flanged sleeves, which are threaded on to the projecting tubes, and which form the bearing surface in the connecting plate. The tapered flanges on the sleeves can thus be drawn by the screw thread into countersunk recesses in the plate and any slack taken up.

A light metal cover beneath the connecting plate forms the seal to exclude dust from the bearings and gear wheels; an aluminum casting, containing the double reflecting prism attached by screws, forms the outer cover.

g. Focusing Adjustment

The focus can be adjusted by rotating a milled collar (1A) on the eye-piece. This collar bears a scale showing single diopters and is figured at zero with 5 divisions on each side of zero, the + and - signs being also engraved.

h. Range-Setting Gear

Ranges are set on the sight by means of a range-setting wheel (6B) on the left of the eye-piece. This range-setting wheel is coupled by a shaft drive including two universal joints (4B) to the mechanism in the graticule box which controls the relative positions of the graticule plates. A limiting stop and a spring-loaded brake (5B) are provided for maintaining the selected range setting.

i. Graticule Box

Two glass plates are arranged in the graticule box: a circular range plate which is mounted to rotate and a plate engraved with sighting marks, which moves vertically.

The scales on the range plate consist of small circles, numbered, as shown in the accompanying sketch, in hundreds of meters. The sighting marks on the other plate consist of a central triangle with three smaller triangles on each side of it. The row of triangles covers an angle of about 1 1/2 degrees in the object space. A fixed transparent pointer (7C) (figures 3 and 4) indicates the range on the scales of the range plate.

To set a given range, the range-setting wheel is rotated, causing the range plate to revolve until the required range marking is opposite the pointer, and causing the sliding plate to move up or down so that the triangular sighting marks indicate a position of the field in accordance with the scale reading.

The range plate (1D) (figure 5) is carried in the center of a cam ring (2D) which is rotated by a gear wheel (3D) meshing with a gear behind it. A radius arm (4D) rests on the cam ring and engages with a vertical sliding block (5D), which is thus raised or lowered on rotation of the cam ring. The

block (5D) engages a block (3C) (figure 4) on the vertical slide (2C) which contains the plate (1C) engraved with the sighting marks. The block (3C) is kept constantly pressed against the block (5D) by a return spring (4C).

Some appropriate measurements of the relative positions of the central triangle for various scale settings gave the following results. (The column headed "position of triangle" gives the approximate angular distance between the central triangle and the circle marking the scale setting.)

MG scale setting	Position of triangle	75-mm scale setting	Position of triangle
0	6° 25′	0	6° 25′
2	6° 32′	4	7° 0′
4	6° 38′	8	7° 42′
6	6° 45′	12	8° 22′
8	7° 0′	14	8° 50′

<u>j.</u> <u>Adjustment of the sight</u>

The sighting point can be adjusted vertically by turning a key (1E) (figure 5) and laterally by turning a key (6C), (figure 4).

Rotation of the key (1E) causes movement of a transverse slide (6D) (figure 5), in which the vertical sliding block (5D) is mounted, thus moving the block (5D) across the block (3C) and hence raising or lowering the sighting point. A spring (7D) constantly exerts pressure against the slide (6D) to take up any play or backlash.

Similarly, rotation of the key (6C) cause movement of a traverse slide (5C) in which the slide (2C) is mounted. At the same time, the block (3C) moves across the block (5D), giving a resultant diagonal motion, the vertical component of which may have to be compensated by turning the key (1E).

Both adjustments are made to fit a square key and the housings are internally threaded, presumably for dust caps, which however were missing in the sight examined.

<u>k.</u> <u>Night Illumination</u>

The mounting for the range-scale plate is drilled on the edge, so

that the scale can be illuminated by the bulb holder (8C) (figure 4) through a glass window on the side of the graticule box. A variable shutter in the bulb holder varies the degree of illumination provided.

1. Miscellaneous

A 10-mm armor plate (3B) (figure 2) is mounted behind the graticule box to give added protection in the case of a direct hit.

20. VULNERABILITY OF GERMAN TANK ARMOR

British forces in the Middle East have recently carried out tests with captured German tanks in order to determine the effectiveness of British and U.S. weapons against them.

The 30-mm front armor of the original German Mark III tank (see this publication No. 3, page 12) is apparently a plate of machinable-quality silico manganese. The additional 30- or 32-mm plates which have been bolted on to the basic 30-mm armor are of the face-hardened type. This total thickness of 60 to 62 mm stops the British 2-pounder (40-mm) AP ammunition at all ranges, breaking it up so that it only dents the inner plate. The U.S. 37-mm projectile, however, with its armor-piercing cap, penetrates at 200 yards at 70°. Against the 6-pounder (57-mm) AP and the 75-mm SAP, this reinforced armor breaks up the projectile down to fairly short ranges, but the armor plate itself cracks and splits fairly easily, and the bolts securing it are ready to give way after one or two hits. If 75-mm capped shot is used, however, such as the U.S. M61 round, the armor can be pierced at 1,000 yards at 70°.

Similar results may be expected against the reinforced armor of the Mark IV.

The new Mark III tank has a single thickness of 50-mm armor on the front, and this was found to be of the face-hardened type. The 2-pounder AP projectile penetrates by shattering the hardened face, but the projectile itself breaks up in the process and the fragments make a hole of about 45 mm. The 37-mm projectile does not shatter during penetration, which is secured at ranges up to 500 yards at 70°. The 50-mm plate is softer than the reinforced 32-mm plates being 530 Brinell on the face and 375 on the back. This plate is not particularly brittle and there is very little flaking.

In tests carried out against the side armor of both the old and new models of Mark III tanks, it was found that this armor showed signs of disking at the back. There is also internal petaling. This, and the condition of the front, which is flaked back at 45° for a short distance, indicates that the heat treatment makes the inner and outer skin harder than the core.

VULNERABILITY OF GERMAN ARMOR PLATE

RANGES IN YARDS

Mk. III and IV: 30-mm (old type)	British Standard	2-pdr H.V.	British 6-pdr	U.S. 37-mm	U.S. 75-mm SAP	U.S. 75-mm APC
Lower front plate and turret can be penetrated at	1,300	1,500	Over 2,000	1,600	Over 2,000	
Vizor plate can be penetrated at	1,400	1,600	Over 2,000	1,800	Over 2,000	
Sides can be penetrated at	1,500	1,700	Over 2,000	2,000	Over 2,000	
Mk. IV: 44-mm (reinforced plates)						
Sides can be penetrated at	1,000	1,200	2,000	1,100	Over 2,000	
Mk. III and IV: 62-mm (reinforced plates)						
Lower front plate can be penetrated at	No penetration		500	200	400	1,000
Vizor plate can be penetrated at	No penetration		600	300	500	1,000
Mk. III: 50-mm (new type)						
Lower front plate and turret front can be penetrated at	200	400	800	500	600	1,500
Vizor plate can be penetrated at	200	400	900	600	700	1,700
Sides can be penetrated at	1,500	1,800	Over 2,000	2,000	Over 2,000	

The Mark IV has only 22 mm of armor on the sides, but this is reinforced by an additional thickness of 22 mm covering the whole fighting and driving compartments. These additional plates are of the machinable type, and the hardness of this plate was found to be 370 Brinell. The bolts holding this extra armor in place are weak, and it was found that the threads stripped easily.

The above table shows the ranges at which the different types of German tank armor are penetrated by standard U.S. and British weapons. The angles of impact are determined by the normal slope of the armor on the tank.

GLOSSARY OF GERMAN WORDS IN COMMON USE

Abteilung	Section, subdivision, battalion, or department.
Aufklaerungsflugzeug	Reconnaissance aircraft.
Ausbildung	Training.
Bordfunker	Radio operator of aircraft
Bordmechaniker (B.M.)	Flying engineer.
Einsatzhafen	Operational airdrome.
Einsatzhafenkommandatur	Operational airdrome command.
Fallschirm	Parachute.
Feldflugplatz	Field landing ground.
Fliegerhorst	An occupied G.A.F. airdrome.
Fliegerhorstkommandatur	Military airdrome command.
Fliegerschuetze	Air gunner.
Flughafenbereichkommando	Airdrome Regional Command.
Flughafenbetriebskompanie	Airdrome servicing company.
Flugmeldedienst	Air raid reporting service.
Flugmeldekompanie	Signal company for observation of enemy aircraft.
Flugwetterdienst	Meteorological Service.
Flugzeugbewaffnung	Aircraft armament.
Flugzeugfuehrer	Pilot
Flugzeugfunkpersonal	Radio personnel (of aircraft).
Funker	Radio operator.
Funkpeilung	Radio direction-finder.
Luftgau	Area supply and communication command.
Luftgaustab	Subsidiary area command, supplies a Fliegerkorps.
Luftnachrichtenabteilung	Signal Section.
Luftnachrichtendienst	Signal Service.
Luftnachrichtenstelle	Signal Station.
Luftnachrichtentruppe	Signal detachment.
Luftnachrichtenzug	Signal platoon.
Luftschraube	Air propeller.
Luftzeuggruppe	Equipment section attached to Luftgau.
Luftzeugstab	Subsidiary equipment section to a Luftzeuggruppe.
Mannschaft	Personnel.
Maschinengewehr	Machine gun.
Nebelgeraet	Smoke-laying apparatus.
Notlandung	Emergency landing.
Oberbefehlshaber	Commander-in-Chief.
Peildienst	Direction-finding Service.
Querruder	Aileron.
Schleuderstart	Catapult take-off.
Seeflugzeug	Sea-plane.
Segelflugzeug	Glider.
Uebungsflugzeug	Training aircraft.
Vereisung	"Icing-up."
Wasserflugzeug	Float-plane.
Wehrkreis	Army area (corresponding to Army Corps)
Wehrmacht	Armed or defense forces.
Z.Z. Verfahren	A blind-landing method.

SECTION II

THE GERMAN AIR ATTACK ON CRETE

[redacted]

THE GERMAN AIR ATTACK ON CRETE

In any study of defense against air-landing and air-borne attack, the more important lessons are those from Crete. The German conquest of this island in May 1941 is as yet the chief instance of success in a purely air-landing operation, against determined resistance, without the effective cooperation of forces employing surface transport either by land or sea. The usual primary objective of such operations is the capture of one or more airdromes through which air-landed troops can be poured in to swamp the local defense, and this has nowhere else been successfully done.

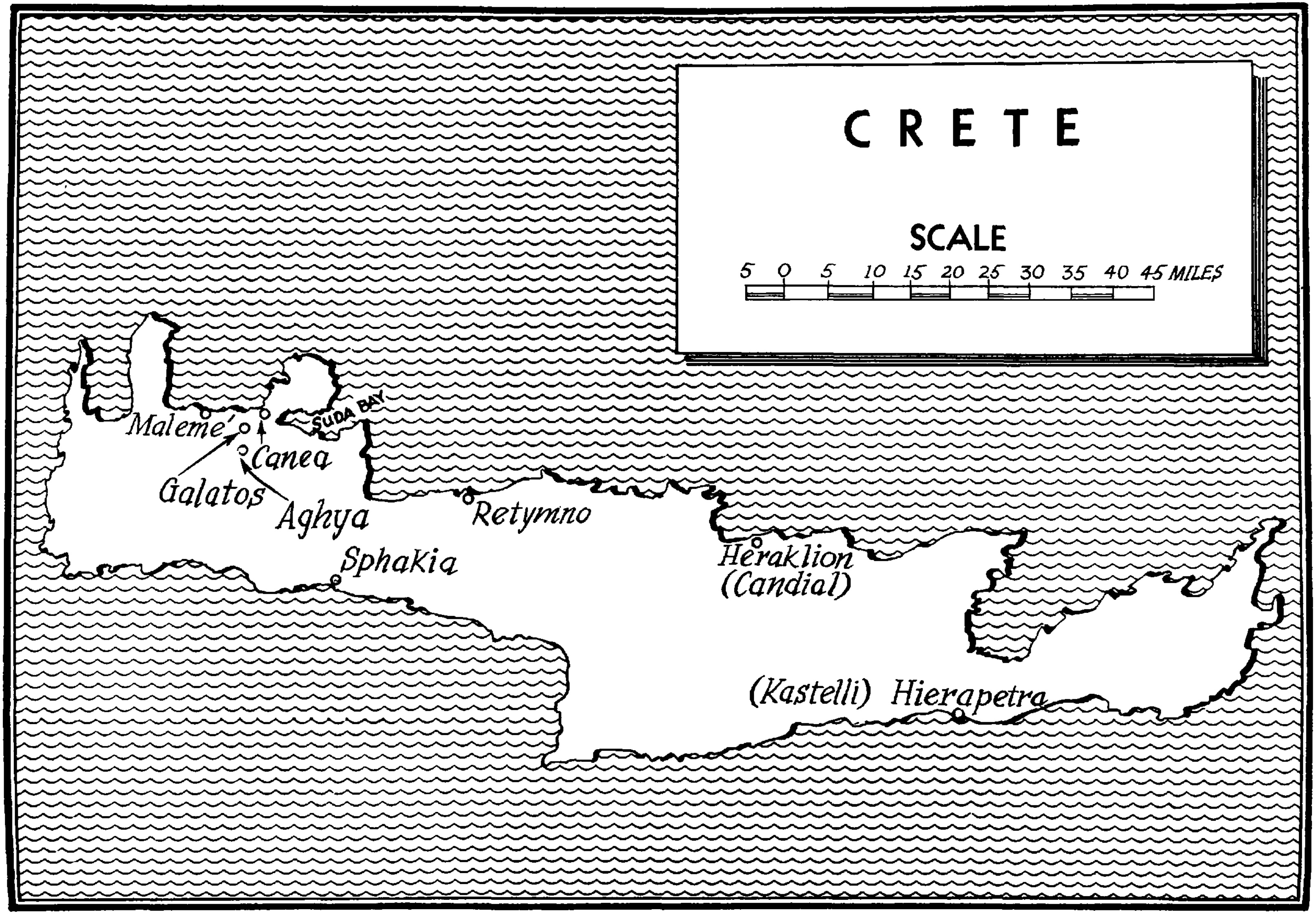
TERRAIN

Crete is about 3,320 square miles in area, and of irregular, enlongated shape, with an east-to-west length of 160 miles and a north-and-south width varying between 7 1/2 and 35 miles. Most of its surface consists of mountains whose upper slopes are snow-covered throughout most of the year. The highest peak rises to nearly 8,000 feet. As in most Mediterranean regions, the lower slopes are largely, although not wholly, deforested. The climate is of Mediterranean type, hot at midday, followed by an acute drop in temperature towards sunset; and the nights are cold.

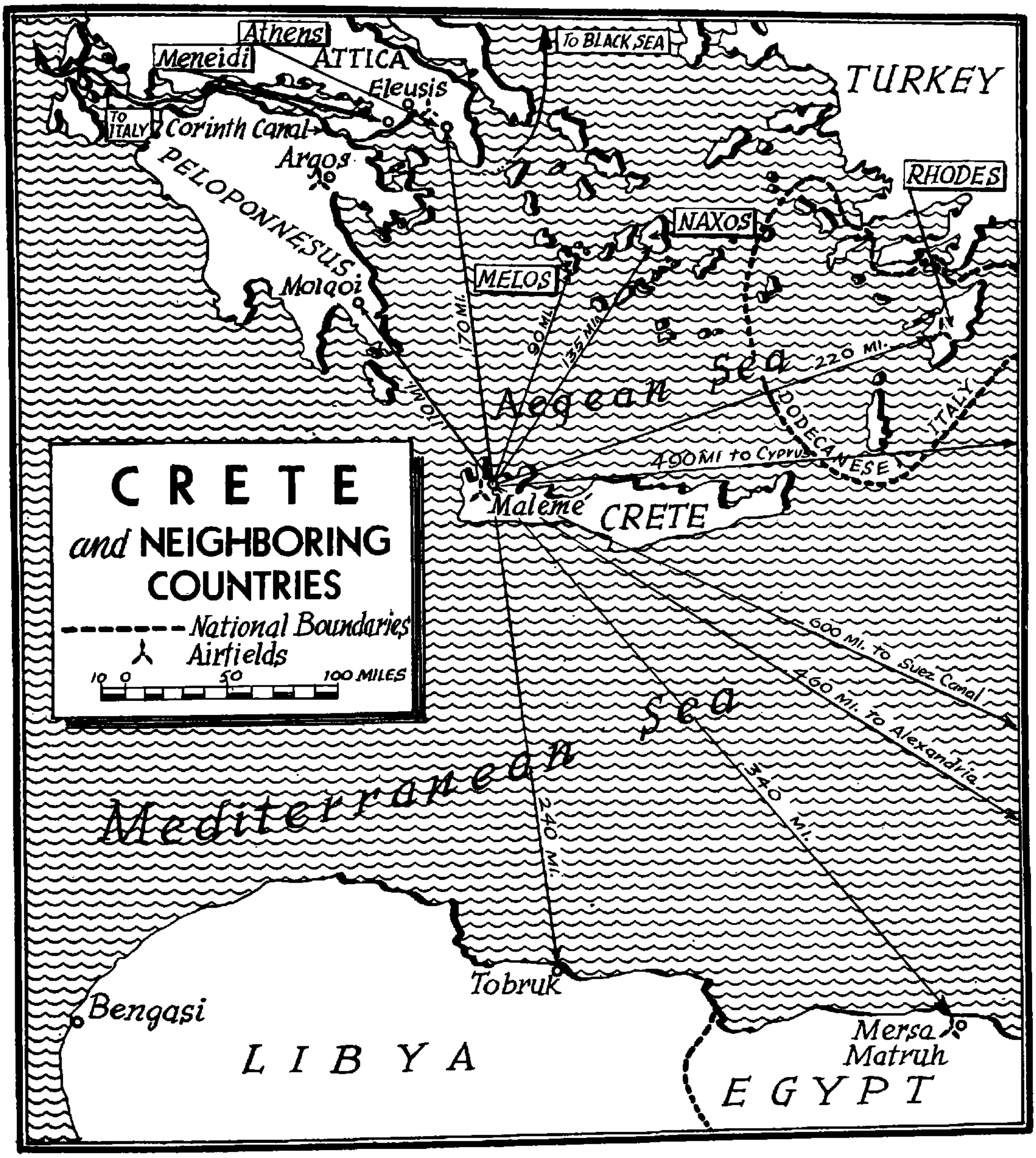
The population in 1928 was just under 400,000. Most of the people live in a narrow strip along the north coast, along which runs the main road of the island. This strip also includes the 3 principal towns which are (from west to east): Canea with about 27,000 people, Retymno with about 9,000, and Candia (also called Herakleion) with about 33,000. The 3 air fields were near these towns: at Maleme, on the alluvial fan of a creek on the north coast about 10 miles west of Canea; at Retymno (a landing strip); and at a point about 4 miles east of Candia. A small auxiliary field was being constructed in May 1941 at Kastelli-Hierapetra in the southeastern part of the island.

The only sheltered harbor for large ships, the fine natural anchorage of Suda Bay, is also on the north coast between Canea and Retymno and somewhat nearer to the former. The one south-coast anchorage showing on the Admiralty chart is the imperfectly sheltered roadstead of Sphakia, almost due south of Suda. The harbor at Candia is shallow and artificial, and there is no shelter for vessels either at Canea or Retymno (see Sketch No. 1). The air distances in statute miles going due east along the north coast are about as follows: from the west end of the island to Maleme, 14 miles; from Maleme to Canea, 10 miles; from Canea to Retymno, 25 miles; from Retymno to Candia, 35 miles; and from Candia to the east end of the island, 66 miles. Thus from Maleme to Candia the total distance is 70 miles.

This 70-mile north-central coastal strip was to be the combat zone. In it the small and fertile alluvial lower valleys are often covered with old olive groves affording good cover from air observation.


CRETE
SCALE
5 0 5 10 15 20 25 30 35 40 45 MILES
SUDA BAY
Maleme'
Canea
Galatos
Aghya
Retymno
Sphakia
Heraklion
(Candial)
(Kastelli) Hierapetra

SKETCH NO. 1


CRETE
and NEIGHBORING COUNTRIES
National Boundaries
Airfields
10 0 50 100 MILES
Athens
Meneidi
ATTICA
Eleusis
TO ITALY
Corinth Canal
Argos
PELOPONNESUS
Molaoi
TO BLACK SEA
TURKEY
RHODES
NAXOS
MELOS
170 MI.
90 MI.
135 MI.
220 MI.
Aegean Sea
490 MI to Cyprus
DODECANESE
Maleme
CRETE
600 MI. to Suez Canal
460 MI. to Alexandria
Mediterranean Sea
240 MI.
340 MI.
Tobruk
Bengasi
LIBYA
Mersa Matruh
EGYPT

SKETCH NO. 2

STRATEGIC SITUATION

The position of Crete with reference to surrounding areas (see Sketch No. 2) made it easy for the Axis to attack, difficult for the British to hold, and important to both. On the recently conquered Greek mainland, the Greek islands, and the Italian Dodecanese Islands, the Axis had a large number of airdromes within easy flying range to the northwest, north, and northeast. The nearest, on the Greek mainland at Molaoi about 30 miles north-northwest from Cape Malea, is only about 93 miles from the northwestern point of Crete, and about 105 miles from Maleme. The field on the island of Melos is only about 93 land miles north of Suda, and that at Naxos about 135 miles northwest of Maleme. The fields in Rhodes the most distant of the Italian-owned Dodecanese Islands, are only about 220 miles east-northeast from Maleme. Numerous and well-established fields lay further back on the Greek mainland at Argos and Corinth in the southern part of Greece, and at Meneidi, Eleusis, and other fields near Athens.

By contrast, the British had to reinforce, if at all, over far greater distances: 240 miles from Tobruk to Maleme, 340 from Mersa Matruh, 460 from Alexandria, and about the same distance from Cyprus. Thus, even with equal air numbers the Germans would have had the advantage, and with their greatly superior numbers they had complete air supremacy.

The importance of Crete to both sides lay in its geographical position. In British hands it furnished a base from which they could bomb the Roumanian oil fields, then the only natural source of oil for Germany. Furthermore, the island was a possible stepping-stone to the Balkan mainland, helped to prevent German isolation of Turkey, facilitated the movements of the British Mediterranean fleet, and correspondingly cramped not only operations of the Italian fleet but also all east-west coastwise shipping in Greek waters, since for the moment the Corinth Canal was blocked. With the island in German hands the situation would be reversed, and in addition Axis supply routes to Italian Tripolitania would be relieved from an additional threat.

BRITISH PREPARATIONS

The general situation in late April was that the British, having occupied Crete in November 1940 and having subsequently intervened on the Greek mainland with a force of less than 40,000 men, had suffered a defeat in which about a third of this force had been killed or captured and the remainder had been evacuated, most of them with very little equipment.

On Crete, there were about 37,500 British and Allied troops, most of whom had been evacuated from the mainland and had taken part in the campaign in Greece. British troops numbered 23,500; about 4,000 were Palestinian and Cypriot labor troops; and some 10,000 were Greek troops, including local militia. As a result of its heterogeneous character and loss of vital equipment (including even messkits), this force was far weaker in fighting strength than the figures would indicate. Another difficulty was the fact that commanders in Crete had been so frequently changed (three times in April) that continuity in preparations for defense had been impossible. The last appointment, of Major General

Freyberg, came on April 28.

The ground defensive works had been improvised by the local British commanders with scanty means and according to doctrines that varied with the individuals concerned. Since it was evident that the airports would be the chief German objectives, defenses were chiefly grouped around the Maleme and Candia fields. A New Zealand brigadier afterwards said that the English officer responsible for the defense of Maleme had laid out too fixed and rigid a scheme, and one too easily visible from the air. By contrast, the defenders of the Candia-Herakleion field were better concealed and were flexibly disposed in depth, with most of them held out for counterattack.

General Freyberg's late arrival allowed him little time in which to rearrange the field fortifications. However, a German officer, describing the campaign, acknowledged the skill of the new British commander's troop dispositions, especially the concealment of the New Zealanders in the old olive grove near Aghya prison, about 8 miles east of Maleme and about 3 miles southwest of Canea. In general, Freyberg's leading idea was to protect the airfields and to deny them to the enemy, posting his troops so that the German parachutists, whose attack he correctly anticipated, must land on a defended area within striking distance of one of his detachments.

On or shortly after May 1, the British became certain that the Germans would soon strike. The opinion of the 3 British services was therefore asked as to whether Crete should be held. All 3 thought the chances slim. The RAF had only 42 serviceable planes on the island, and the British air strength in the whole Middle East was very limited. The Navy considered missions in Cretan waters without adequate air support to be suicidal. Freyberg said he would fight in any case, but thought the position hopeless without full air and naval support.

Against the 42 British planes, the Germans were about to attack with nearly 800 bombers and fighters, 500 transport planes, and 75 gliders. Thus, with the RAF strength negligible before May 19, and wholly absent after that date, the ill-assorted and ill-equipped 37,500 British and Greek troops on the ground were to contend unaided against about 35,000 German air-landing troops backed by overwhelming air support.

The naval aspect may be summarized by noting that the powerful British Mediterranean Fleet succeeded in preventing Axis small-boat landings during the decisive phase, but only at the price of losses so great that, had the fleet not been withdrawn, control of the Mediterranean might have passed to the Italians. The Royal Navy contributed to the ground action only in an indirect way by diverting German air strength; on the decisive day, May 22, there was a lull in the bombing of British ground forces because German bombers were attacking the warships.

[redacted]

GERMAN PREPARATIONS

The German Intelligence made mistakes which might have affected the outcome of the operations. Most serious was their idea that all British troops evacuated from Greece had gone to Alexandria rather than to Crete; this led to an estimate of Allied strength on the island as 3,500--less than a tenth of the real numbers. Other German miscalculations were that no Greek troops were on the island, and that a considerable portion of the islanders were pro-German. Nevertheless, German energy and flexibility were to succeed in spite of a wholly inaccurate intelligence estimate.

The German attack, including preparations, falls into four clearly marked phases, which suggest a possible pattern of air-landing operations. First, reconnaissance and the establishment of air supremacy; second, air bombardment, including machine-gun strafing; third, seizure of one or more fields by air-landing attacks; and fourth, exploitation of the air-landing attack by pouring in air-landed reinforcements. The third phase is usually the decisive one. The phases interlock: reconnaissance continues through the operation, and air bombardment continues throughout both seizure and exploitation.

The timetable of the Cretan operations is as follows: organized British resistance on the Greek mainland having ceased approximately on April 30, phase 1 (reconnaissance of Crete), began on May 1 and continued for 10 days accompanied by light dive-bombing and strafing. On May 10, phase 2, that of heavy air bombardment, began and was most successful. Phase 3, that of air landings, was begun on May 20, ending late on May 22 with the clearing of Maleme airport and its neighborhood of the British. On May 23, phase 4, exploitation by normal air landings, was begun, and on the night of May 31 the last organized British evacuation ended.

For about a month before May 20 there had been a general German movement south. Transport planes and gliders gathered near Athens and Corinth. Special troops came by air, sea, road, and rail. Supplies and stocks of munitions were accumulated. Advance landing fields near Crete, on the Aegean Islands of Naxos and Melos, and in the Peloponessus at Molaoi, were hastily constructed.

Air photography on Crete began about May 1 and continued until May 10, accompanied by light dive-bombing and strafing. The German plan for the main attack was based upon abundant air photographs, and from them the assaulting troops were carefully instructed as to the terrain and British positions. German prisoners taken during the main attack were well provided with good sketch maps.

From May 11 to 17 inclusive, there was daylight bombing and strafing of increasing frequency and intensity. By May 18, German air action had reduced the serviceable British aircraft to three Hurricane fighters and three Gladiator fighters at Candia, and one Hurricane at Maleme. Since they were contending against odds of nearly a hundred to one, and seem to have had no good shelter on the ground, this tiny remnant was flown to Egypt on May 19--which happened to be the day before German air landings began.

The crews of the British antiaircraft guns suffered severely from lack of adequate concealment, most of them were driven from their gunpits after firing only a few rounds. Contemporary press reports spoke of one gunner who knocked down a number of German dive bombers by holding his fire until each had dropped its bomb and flattened out; thus the gunner did not give away his own position. Often, however, groups of three German pilots would dive on a British gun position simultaneously from different angles, so that one or two of the group would be attacking the gun in the flank or rear while it was being aimed at the third.

From May 17 to 19 inclusive, air bombing and strafing were further intensified in order to break the defender's morale. Attacks on the Maleme and Candia airdromes were especially heavy and frequent. Heavy air attacks were also directed at the one good British debarkation point, Suda Bay, which became a graveyard of ships. During May 18 Suda was heavily attacked seven times by dive bombers with fighter support. The effectiveness of the air attacks on British shipping may be judged from the following figures: of 27,100 tons of supplies shipped from Egypt only 2,700 tons (10%) were successfully unloaded, 3,400 tons (12.5%) were sunk, and 21,000 tons (77%) had to be returned to Egypt because it was not practicable to unload them between 2300 and 0300--which was the only period when unloading could safely take place. At least 14 cargo ships were sunk at Suda.

Having thoroughly reconnoitered, interrupted supply, beaten down the slight air resistance, and partially worn down the ground defenders, the Germans attacked with airborne troops at dawn on May 20.

THE ATTACK: MAY 20

The dawn attacks of May 20 struck the Maleme-Canea area, especially at Maleme, where some defenders claimed the intensity of the 90-minute preliminary bombardment exceeded any artillery preparations of 1914-18. Gliders landed west of the airdrome under cover of the dust cloud raised by the air bombardments, and parachute troops promptly began landing behind them and on the airdrome itself. The New Zealanders made eight successful bayonet charges, but were constantly driven back by intense bombing and strafing, and during the night of May 20-21 withdrew one-half mile eastward. The airdrome however was still under artillery fire.

Also at dawn, 1,800 glider troops and parachutists landed southwest of Canea. Here, a New Zealand brigade with some crack Greek troops had been well concealed and entrenched among olive trees. The fighting in this area was intense, and a German officer states that the heaviest German losses occurred here. By nightfall all Germans in the area had been mopped up, except those in a strongly walled prison at Aghya, which they organized defensively, using the labor of the prisoners.

At Retymno, German parachutists landing at 1600 had been cleared from the airdrome but had held nearby, and had captured some field guns and two tanks.

Candia, also attacked at 1600 but ably defended in depth from well-concealed positions, held well, and all parachutists who landed within the airdrome perimeter were killed.

Astonished but not discouraged by the unexpected strength of the garrison and by their own heavy losses--the British estimated they had killed 80 percent of the parachute troops who had landed--the German High Command decided to throw in their whole air-landing strength.

In the attack phase which opened on this day, most of the offensive work on the ground was done by parachute troops. However, in this instance, such troops were preceded by the landing of glider troops.

The reasons of the Germans for having the first air-landed troops come in gliders were that the silent approach of the motorless planes might achieve surprise, and that if unmolested by the defenders these light aircraft would land safely on almost any terrain. Also, their passengers could leave them fully equipped and therefore ready for almost instant combat, whereas parachute troops on landing are at first nearly helpless, and remain below their full combat value for some time.

Parachutists are not only helpless while descending but also during the first half minute after landing. They are more or less helpless during the first two minutes and still very vulnerable throughout the first five minutes. If their arms containers are captured or covered by fire they cannot fight. Consequently prompt counterattack by the defenders, even when far inferior in numbers, is often successful.

On the other hand German gliders are vulnerable in the air because most of the ammunition, instead of being carried on the men or packed in strong and comparatively small containers as in the case of parachute troops, is packed together in the fore part of the glider where it will explode if hit, destroying both the ship and all on board. Moreover the slow speed of the glider as compared with a motored plane makes it comparatively easy to hit on the wing.

The mission of the glider troops was to cover the first parachute landings.

The first parachutists to land followed the gliders closely. The parachutists had the normal objectives of such troops--to seize airfields and to disrupt the defender's communications, thus preventing defensive movements and counterattacks.

The German parachutists who landed in Crete were organized not merely in single companies attached as advanced guards to normal air-landing divisions as in Holland, but in an organic "division"--we might call it a reinforced brigade--of three regiments.

Tactically the parachutists were light infantry with considerable small-arms fire power but with no heavy weapons and only a few medium-heavy ones. Their method was that of "vertical envelopment," divided into a holding attack and main attacks as in envelopments on the ground. The main attacks are intended to seize an objective; the holding attacks are made by smaller groups who divert the enemy from concentrating on the main attack and cut his communications in order to prevent him from counterattacking. On the ground, parachutists are relatively immobile since they have no transport except what they may be able to seize.

Thus the main attack against Maleme came from the west, the parachutists landing behind an advance guard of glider troops. Meanwhile, two smaller parachute groups landed farther east in rear of the defenders. Another main parachutist attack was aimed southwestward against the Galatos-Aghya position west and southwest of Canea, with a glider group and two small parachute groups landing in the defender's rear.

A German account claims that the British expected the main attack to fall upon Retymno and Candia, but there is no evidence of this in British accounts of their dispositions.

THE ATTACK: MAY 21

The second day, May 21, went somewhat in favor of the British except at Maleme. There, and on the nearby beaches, planes attempted in the morning of May 21 to land normally, or to crash-land, with troops, guns, and motorcycles. Heavy German losses resulted, especially from artillery fire, but at 1615, 500 fresh parachutists landed behind the airdrome defenders. On the same day, May 21, an attack by reinforced parachutists from Aghya against Galatos was repulsed. At Retymno the British counterattacked, cleared the airdrome, and retook their captured guns and tanks, but were unable to destroy other groups of parachutists who had cut the road both east and west, and had been reinforced. The town of Candia and its airdrome were held after bitter fighting, and only Maleme seemed insecure.

THE ATTACK: MAY 22

On the third day, May 22, two New Zealand battalions at Maleme attacked with bayonets and reached the airdrome after fierce fighting, but could not hold the airfield in daylight against 400 unopposed German dive-bombers and fighter planes. Fresh Germans continually landed.

Late on May 22 the turning point was reached. Despite the extreme fatigue of the troops--a number of units had made up to 20 bayonet charges--Freyberg decided on a last desperate attack to retake Maleme airfield. Before this attack could be made, however, reinforced German troops from Aghya succeeded in moving north and cutting the communications between the British defenders of Maleme and those in the Canea-Galatos area. Retreat of the Maleme defenders had to be ordered; Maleme field became a secure German operational base; the

decisive phase of the attack ended; and the phase of German exploitation of their victory began.

EXPLOITATION: MAY 23 to MAY 31

Throughout May 23 Retymno held. Shortages necessitated a 30 percent cut in rations, and medical stores were also insufficient.

On May 24 the Germans further intensified their air attacks, brought in fresh troops by air, and prepared to attack the Galatos position held by the tired New Zealanders. During the night of May 24-25, a commando force originally intended to lead a counterattack against Maleme was successfully landed at Suda by a destroyer, but the situation had so deteriorated that this force had to be used as a rear guard. General Freyberg judged that his tired troops could not hold much longer. Nevertheless, when about 2000 on May 25 the Germans broke through the Galatos position of the New Zealanders and took Galatos village, two greatly fatigued New Zealand battalions charged with the bayonet and retook the village. General Freyberg considers this charge one of the great efforts in the defense of Crete.

From May 26 to the last naval evacuation from Sphakia on the night of May 31, the British mission was to save as many troops as possible. That they were able to save 14,580 (53 percent) of the British garrison of 27,500, was because German air attacks slackened. Continuation of intensive attacks, so British officers estimated, would have meant practically complete destruction of the British garrison.

The defenders of Candia were in control of the local situation and considered themselves victorious until ordered to evacuate on the night of May 28. The seizure of Maleme airdrome had been decisive. The loss of a single airdrome meant eventual defeat everywhere in Crete.

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TACTICAL AND TECHNICAL TRENDS

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TACTICAL AND TECHNICAL TRENDS

SECTION I

1. GERMAN SUB-STRATOSPHERE PLANES

The German Air Force has devoted considerable attention to specialized high-altitude aircraft. Several years ago a two-engined monoplane built by Junkers broke the world's altitude record. Since then the Junkers concern has continued its experiments, taking out a number of patents on devices in connection with sub-stratospheric flying.

Development of the German high altitude plane is exemplified by the Ju-86, P1 and P2 types. Both of these planes, the former a bomber and the latter a reconnaissance plane, follow the proven Junkers Ju-86 design, being two-engined, low-wing, all-metal monoplanes fitted with the typical "double wing" flaps and ailerons, but having twin fins and rudders.

Both types have a clear-visioned, transparent, short-nosed cabin. In appearance they are somewhat similar to the Ju-88 and at high altitudes have been mistaken for this plane.

The Ju-86 P types are powered with two Junkers Diesel Jumo 207 A/1 liquid-cooled engines of approximately 1,000 horsepower each. The structure of these planes is quite light, particularly as to the wings, and pilots are therefore prohibited from stunting them or pulling quickly out of dives.

These planes are fitted with sealed pressure cabins,housing the pilot and one observer or bomber. Within the heated and oxygen-equipped cabin the air pressure is controlled by a contact altimeter which automatically maintains inside pressure conditions equivalent to an approximate altitude range of 10,000 to 11,500 feet.

If, owing to leaks or other causes, the cabin pressure falls or rises beyond either of the above limits, the pilot is warned by means of a light signal above the altimeter and the sounding of a horn.

The pilot and his observer or bomber wear extra-heavy flying suits and gloves. For bailing out at high altitudes, parachutes are generally provided with oxygen-breathing apparatus. If, however, this equipment is lacking the crew are instructed to make a "free fall" and not to open their parachutes until reaching an altitude of about 13,000 feet.

The speed of the Ju-86 P types is estimated to be approximately 220 mph up to 20,000 feet and approximately 185 mph above this altitude. Ranges of 1,400 to 1,750 miles are believed possible.

While no definite ceiling has been established, it is thought that the Ju-P1 is able to attain an altitude of approximately 39,300 feet with full bomb load, and that the Ju-P2 can reach a considerably higher altitude. Very recently an aircraft believed to be a Ju-86 P2 was intercepted at approximately 43,000 feet altitude.

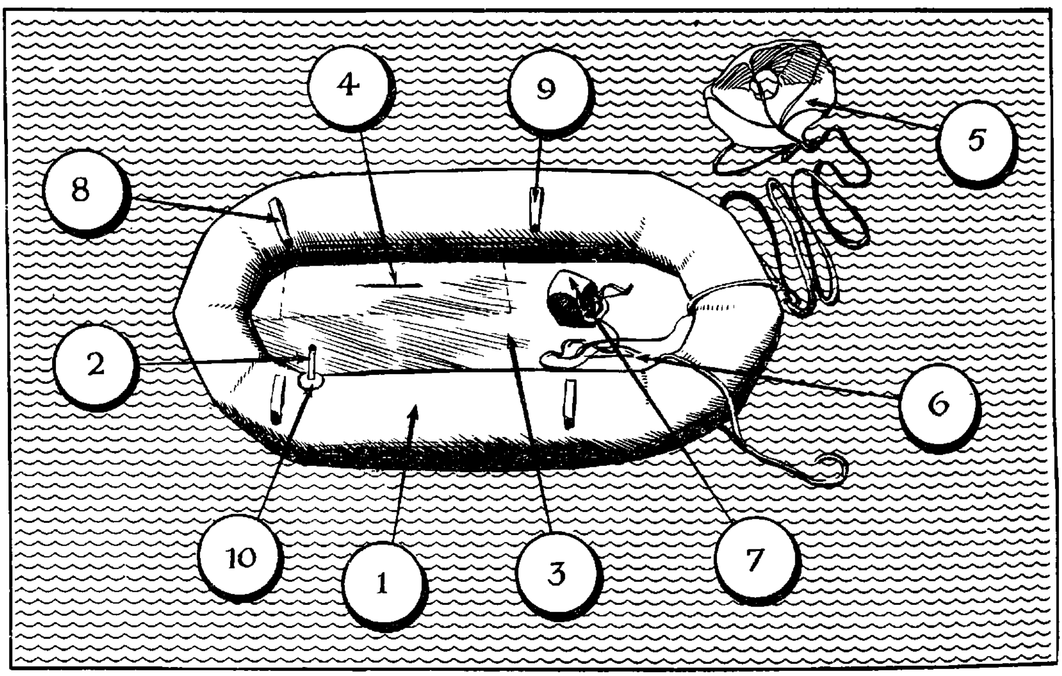
2. GERMAN SINGLE-SEATER INFLATABLE DINGHY

A German equipment handbook furnishes a description, with instructions for use and maintenance, of this rescue apparatus. It is employed by the crews of fighter and bomber aircraft when parachute descent is preferred to an emergency landing on the water. In the present brief treatment of the subject, only a general description of the appliance is given.

This dinghy is contained in an outer pack, which serves as the rear apron of the parachute, is attached to the person by two straps, and remains in place after the parachute has been jettisoned. It must be worn with backless types of life-jackets.

The accompanying sketch shows the dinghy, which is made of balloon fabric painted yellow for better visibility on the water.

When inflated the dinghy is about 5 1/4 feet long and 2 3/4 feet wide. The diameter of the tube is about 9 inches. When packed, the weight of the dinghy, including the CO_2 bottle, sea-anchor, and bailer, is 10 and 1/2 pounds.



Further emergency sea equipment for use with the dinghy consists of:

1 backless life-jacket
1 pair of leggings with pockets for recognition signals
2 bags of dye (to color water for attracting attention of aircraft)
1 single-barrel signalling pistol
10 marine-type (5 red, 5 white) signalling cartridges
1 distress signalling lamp
1 signal flag
1 clasp knife.

Emergency rations and "pervitin" (see Tactical and Technical Trends, No. 5, p 32) are also supplied.

The principal parts are: rubber tube (1) with inflating valve (2), floor (3), and pocket (4) for sea anchor (5), and pocket (6) for bailer (7).

The rubber tube (1) has a volume of about 47 1/2 gallons, and is immersed to half its depth when loaded with one person and equipment. The liquid carbon dioxide, when released from the flask in the outer pack, inflates the tube and pushes it out of the pack. The capacity of the flask is such as to produce about 26 gallons of gas. This is only enough to inflate the boat partially, as otherwise (i.e. if fully inflated) it is very difficult to board. After boarding inflation is completed by the mouth.

The CO_2 flask is connected with an inflating pipe (2) on the dinghy tube. A non-return valve prevents escape of the gas from the dinghy. The inflating valve is provided with a cap (10) for use when inflating is completed.

In the bow of the dinghy are two handles (8) for boarding. Two other handles (9) at the middle of the dinghy serve for holding on in a heavy sea.

The equipment consists of a sea anchor (5) and bailer (7). The anchor is attached by a line to the stern of the dinghy. When thrown overboard, this anchor keeps the boat stern to wind. The bailer of impregnated fabric is used to empty the dinghy of water. Both are stowed in separate pockets (4 and 6) in the bottom of the dinghy.

ANTIAIRCRAFT

3. SMALL-ARMS FIRE AGAINST LOW-FLYING AIRCRAFT

Small-arms fire against low-flying aircraft has been used extensively in North Africa.

It is reported that the Germans make the best use of this fire, though the British also use it effectively. Effectiveness depends upon the training of the

soldiers, their watchfulness for approaching aircraft, and the refusal to be stampeded and run when attacked.

The fighter pilots who carry out low-flying attacks consider this type of mission the most dangerous of all. The effectiveness of small-arms fire by Axis ground troops is illustrated by the history of the use of the Boston support bomber. This bomber, though built and designed for low-flying attacks, is being used at from 10,000 to 12,000 feet. It proved to be very vulnerable to small-arms fire from 50 feet to 100 feet. As the altitude of the attack was raised, the aircraft came within heavy machine-gun range and, later, light and medium antiaircraft fire, until 10,000 feet was considered the safest altitude.

As to the effectiveness of the British fire, one observer reports having seen three out of six Fiat CR-42 Italian fighters shot down within 5 minutes by small-arms fire while carrying out a low ground-strafing attack near Knightsbridge. It must be remembered, however, that the CR-42 is an obsolescent aircraft and that all of them were flying at about 100 feet, which is too high for such an attack.

4. ANTIAIRCRAFT DEFENSES OF GERMAN WARSHIPS

For information of land-based planes which attack enemy warships, Tactical and Technical Trends No. 8, p. 19 included a summary of the planes and antiaircraft guns normally carried by Japanese warships. The following information is submitted on similar German naval defenses. The material for both articles was furnished by the Office of Naval Intelligence.

As in the case of the Japanese warships, the number of light antiaircraft guns listed may not always be accurate, for both the number and position of these smaller weapons are changed frequently. Most of the machine guns are mounted for 360° traverse and elevation up to 90°, while a few auxiliary machine guns are more limited in their field of fire. The symbols used are explained in Tactical and Technical Trends, No. 4, p. 25. In addition to the symbols there listed, "O" before a ship designation indicates an old model.

CHARACTERISTICS OF GERMAN NAVAL AA GUNS

	0.79-in (20-mm) MG	1.46 in	3.5 in	4.1 in
Muzzle velocity	2,950 f/s	2,950 f/s	2,750 f/s	2,900 f/s
Maximum horizontal range	6,100 yds	12,400 yds	18,000 yds	19,100 yds
Maximum effective range at 70° elevation	7,000 ft	16,000 ft	25,000 ft	30,000 ft
Weight of projectile	0.253 lbs	2.105 lbs	19.8 lbs	32.2 lbs
Rate of fire (theoretical)	280 rpm	120 rpm	20 rpm	15 rpm

Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
BB	Tirpitz	42,000	791	32+	16 4.1-in*	Broadside.	No details.	4
BB	Scharnhorst	26,000	741 1/2	32+	14 4.1-in*	Broadside, one mount centerlined aft.	16 1.46-in***	4
BB	Gneisenau	26,000	741 1/2	32+	14 4.1-in			
OBB	Schlesien	13,040	419	18	4 3.5-in**	End of superstructure abaft mainmast.	4 0.79-in (20-mm)	--
OBB	Schleswig-Holstein	13,040	419	18	4 3.5-in			
CA	Scheer	10,000	609 1/4	26	6 4.1-in	Paired in broadside mounts and one centerlined aft.	8 1.46-in and 10 0.79-in MG	2
CA	Lützow	10,000	609 1/4	26	6 3.5-in	Concentrated on fore and aft of superstructure.		2
CA	Hipper	10,000	639 3/4	32	12 4.1-in	In pairs, two mounts on forward part of superstructure, two aft, two broadside; together they fire an azimuth of 360°.	12 1.46-in	4
CA	Prinz Eugen	10,000	654 1/2	32	12 4.1-in			
CA	Seydlitz	10,000	654 1/2	32	12 4.1-in			
CL	Köln	6,000	570	32	6 3.5-in	In pairs broadside aft; and one mount centerlined aft. (Lighter guns broadside and forward.)	8 1.46-in and 4 0.79-in (20-mm) MG	2
CL	Leipzig	6,000	580	32	8 3.5-in	In pairs broadside; one mount centerlined aft. (Lighter guns chiefly broadside and forward.)	4 0.79-in (20-mm) MG and 8 1.46-in	2 2
CL	Nürnberg	6,000	603	32	8 3.5-in	In broadside pairs amidships.	8 1.46-in and 4 0.79-in (20-mm) MG	2
CL	Emden	6,000	508 1/2	29	3 3.5-in	Abaft funnels.	4 0.79-in (20-mm) MG	
CV	Graf Zeppelin	19,250	820 1/4	29	10 4.1-in	Not known.	18 1.46-in and 4 0.79-in (20-mm) MG	Not known.
DD	Six destroyers	--	--	--	--	--	4 1.46-in and 4 0.79-in (20-mm) MG	

* 4.1-in and modern 3.5-in guns are paired in dual-purpose light-shield mounts.

** Old type 3.5-in are in single-shield mounts.

*** 1.46-in machine cannon are in either twin or single open mounts.

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5. NOTES ON RUSSIAN DEFENSE AGAINST GERMAN TANK ATTACKS

The following notes on Russian methods of defense against a tank attack are taken from an article which appeared recently in the Soviet press.

German tank attacks generally follow the main road in the direction of the axis of the Russian communication lines. The attack opens with the shelling of the main road, thus covering the infiltration of small groups of automatic riflemen, who attempt to destroy the Soviet gun crews. Then three or four German tanks appear at a distance of a half mile or more, and open random fire to draw and locate the opposing antitank guns.

If the artillery defense is well organized, "the German tank attack invariably ends in failure." Long-range artillery has the mission of destroying the enemy tanks in assembly areas and in defiles prior to the attack. After the tanks have crossed their line of departure and broken through the forward positions, the antitank system comes into operation.

Antitank-gun crews operate on the principle of direct fire. Crews are taught not to fire at tanks at random, but to carefully pick and choose the most vulnerable spots; for example, the sides. Hits on the turret generally ricochet and even a direct hit on the turret will not necessarily destroy the tank's crew; the tank can still run and continue to fire with its remaining machine guns. Where the tracks are damaged, however, the tank is stopped and presents a very easy target.

ARTILLERY

6. RED ARMY ARTILLERY TRAINING

American observers were recently allowed to inspect the training center of a Red Army artillery unit and to observe gun crews and staffs in training.

The unit inspected was a 152-mm gun-howitzer regiment, designated as Army artillery. The regiment was composed of three battalions, of three to four batteries each.

A four-gun battery in firing position was inspected. Each gun crew was composed of nine men. Characteristics of the gun were as follows: weight, 8 tons; range, 19,500 yards; weight of projectile, 88 pounds.

The distance between the guns of the battery was 30 yards. Each gun was emplaced in a pit with 5-foot revetments built up on all sides. On either side of the entrance to the gun-pit were dugouts where the gun crews could take refuge during heavy enemy shelling.

An observed gun crew executed march order in 4 1/2 minutes; the

normal time is 6 minutes. The barrel was pulled back into traveling position by hand wheels on either side at the breech end of the cradle.

In gun drill, 17 seconds elapsed between rounds in dry runs. One member of the crew handed the charges to another who placed them in a shell case. The shell case was inserted in the chamber after the projectile had been rammed home.

The group then inspected a battalion fire-direction center in a shallow dugout in the side of a hill about 150 yards distant from the gun position. This center consisted of an officer, assistant, and two telephone operators with two telephones connected to a switchboard. On a plane table was a firing chart called a "planshot" built on a 1,000-meter grid system on which were plotted battery positions located by adjusted data on the base point.

Regimental and battalion OP's were then inspected. It was explained that the regimental CO and the battalion CO are always at their respective OP's. Several periscopes with single eyepieces were spaced about 10 feet apart. Their readings were recorded and plotted, and the location of points in the target area were determined trigonometrically. On hand at each OP were cards 6 x 4 inches, showing locations of points with respect to the OP and an RP.

Rockets are fired from the regimental OP to indicate direction to other observers in order to facilitate quick orientation.

According to the officer conducting the inspection, Lt. General Tikhonov, assistant inspector of the Red Army artillery, the training center was so conducted that it was possible to organize and train a regiment of 152-mm gun-howitzers in 8 weeks, even though none of the personnel had had any previous artillery training. In order to achieve such results, however, a training schedule calling for 15 hours of training a day was necessary. If the personnel had had previous artillery training, a regiment could be organized and trained in 4 weeks.

The General also stated that at the siege of Sevastopol the Germans had used a weapon, presumably a howitzer, with a caliber of 615 mm. The Germans were also employing 320-mm mortars on the Eastern front.

Little was learned about the so-called secret Soviet "weapon of hell" or "Katyusha (little Katherine)," except that it was a type of mortar of tremendous size, handled by special troops who withdrew the weapon to the rear after it had been fired, in order to prevent its capture. It was stated that the Germans had dropped pamphlets stating that further use of this weapon would result in the employment of gas by the Germans.

7. GERMAN 105-mm HOWITZER

This howitzer is a standard German light field-artillery weapon and

GERMAN 105-mm HOWITZER

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compares favorably with the U.S. 105-mm howitzer (see Tactical and Technical Trends, No 6, p. 12 for tactical employment). This howitzer, marked by a long barrel and split trail, and by the counter-recoil cylinder mounted above the tube, is so constructed that it can be fired either as a gun or a howitzer. Its semifixed ammunition and maximum elevation of 47° give it the characteristics of a howitzer. The long barrel allows high muzzle velocity, and the long split trail gives stability when the weapon is fired as a gun.

The following table presents general data on the complete German 105-mm howitzer:

Maximum range	11,674 yds
Maximum muzzle velocity	1,542 f/s
Weight of shell (std)	32.65 lbs

Weights

Complete howitzer	4,260 lbs
Upper shield with stays	107 lbs
Breech mechanism (exclusive of breech ring)	109 lbs 2 ozs
Elevating mechanism (less arc)	67 lbs 9 3/4 ozs
Traversing mechanism	22 lbs 14 1/2 ozs
Top carriage	75 lbs 14 ozs

Dimensions

Overall width of carriage (hub to hub)	78.8	in
Ground clearance (bottom of top carriage)	13.5	in
Trunnion height (to center)	46.25	in
Diameter of wheel	50.75	in
Width of tire	4.00	in
Overall length of piece (travelling position)	220	in
Trail length, overall	11.32	ft
Shield thickness of plate	0.157	in
Total length of howitzer	115.78	in
Depth of breech recess	9.06	in
Depth of chamber	11.2	in
Length of bore	92	in
Depth of groove	0.047	in
Width of lands (at bottom)	174	in
Number of lands	32	
Number of grooves	32	

The performance of the howitzer is limited by the use of the zone 5 charge as the standard charge instead of the zone 6 charge. The muzzle velocity is thus reduced from 1,542 feet per second to a standard of 1,283 feet per second, and the maximum range is reduced from 11,674 yards to a standard of 10,007 yards.

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The performance of the howitzer has also been limited by using separate loading ammunition. This has lowered the maximum rate of fire of the howitzer and thus reduced its effectiveness.

The breech mechanism is simply designed and can be completely disassembled. The firing mechanism can be operated only in the fully opened or fully closed positions, and a manually-operated safety lock is provided as an additional safety device. The breech mechanism is very heavy, weighing 109 pounds.

The recoil and recuperator system is of the hydropneumatic type.

The top carriage is principally of welded design and made of sheet steel 0.3 centimeters thick. The trunnion caps are of the split-bearing type.

The elevating mechanism is completely enclosed except for the elevating arc and its pinion. The total elevating arc is 47 degrees and 37 minutes. The mechanism is designed to absorb the recoil and counter-recoil forces by permitting a movement of the worm and the worm wheel against Belleville springs.

The traversing mechanism is of the screw-and-nut type and is almost completely enclosed. The total traversing arc is 56 degrees and 14 minutes, equal on both sides. The mechanism can be assembled as a complete unit before being assembled to the carriage.

The howitzer can be emplaced for firing with a minimum number of operations, as it is automatically placed in three-point suspension for firing and the trails locked in position when the trails are opened.

The bottom carriage is of complicated design and includes a larger number of parts than the U.S. design.

The trails are of heavy riveted construction but move freely. After road tests, with the lower carriage splattered with mud and dust, the trails were opened without difficulty, but could not be closed.

The trail lock (a spring-operated pin) functioned satisfactorily in locking the trails in the open position, but at times it was difficult to release the trail lock to close the trails.

The optical fire-control equipment is very similar in its general features of design and construction to that used by the United States.

The complete round is of the separate-loading type and consists of a propelling charge (in a case) and a fuzed projectile.

The propelling charge consists of the following components:

(1) A cartridge case made of either steel or brass.

(2) A primer of the same type and contour as the British 40-mm primer. The German primer is not renewable.

(3) The propelling charge consists of five zones in cloth bags and a nitroglycerine powder which is not flashless. The powder used in the base zone is in the form of sheets, and in the other zones is in the form of small, square flakes.

(4) A flash-reducer, consisting of approximately 0.9 ounces of spun lead wire, is attached on top of the base zone.

(5) A cardboard closing-cover is supplied with a cloth lifting-handle. This cardboard is sealed in place and is very difficult to take off for removal of the zone charges.

The projectile consists of the following components:

(1) A contoured, superquick, 0.25-second delay fuze.

(2) A booster inserted in the top of the projectile.

(4) A spotting charge consisting of a pellet of 3.7 ounces of red phosphorus.

(5) A two-piece steel shell similar in contour to the U.S. 105-mm shell, M1. The rotating band of the shell consists of a single strip of copper bonded to a mild steel base and apparently rolled into place.

(6) The design of the round greatly reduces its effectiveness, since only 3 pounds of high explosive are contained in the shell.

The howitzer may be either tractor-or horse-drawn. In tractor-drawn units, a light tractor is used. When horse-drawn, the howitzer is pulled behind a limber of a six-horse team.

8. USE OF FLAME-THROWER BY ITALIANS IN RUSSIA

The Italians on the Russian front are reportedly making extensive use of flame-throwers as supporting weapons for infantry action.

The flame-thrower used is known as Model 35, capable of throwing a flame 22 yards and making untenable a zone 39 yards long by 17 yards wide.

The device weighs approximately 60 pounds and can produce 10 intermittent jets of flame representing 20 seconds of continuous fire.

It is considered inadvisable to employ the flame-throwers in units smaller than a flame-thrower group organized as follows:

> 1 leader, 1 assistant, 6 squads of 2 teams each; a team composed of 1 operator and 1 assistant.

Thus there is a group of 26 men, which breaks down to 12 teams, each operating 1 flame-thrower.

Comment: The weapon covered by this report is not superior to our flame-thrower, but it is felt that the method of employing flame-throwers in groups of 12 should be of interest to the troops in the field.

9. GERMAN CHEMICAL WARFARE AGAINST LANDING OPERATIONS

Landing operations present excellent opportunities for the use of toxic smokes (sternutators). Recent information received from abroad indicates that the Germans are manufacturing sternutators on a large scale and it is believed that they contemplate using them.

10. JAPANESE CHEMICAL WARFARE ORGANIZATIONS AND GASES

a. Organization, Administration and Strength

During the Sino-Japanese hostilities beginning in 1937, chemical warfare units were organized by the Japanese. These were known as "Field Gas Companies," "Temporary Smoke Battalions," and "Infantry Regimental Temporary Smoke Companies." In addition, certain infantry regiments were reported to have a 13th company which was used for chemical warfare purposes, although this may be identical with the infantry regimental temporary smoke company mentioned above. All the above units were equipped with the toxic-smoke and lachrymatory-gas candles (see Tactical and Technical Trends No. 7, p. 10 for additional information on this subject).

b. Field Gas Companies

Field gas companies are nondivisional units which are allotted to divisions for specific operations. Their organization is not known, but they are believed to supply personnel and equipment for temporary smoke battalions.

c. Temporary Smoke Battalions

Temporary smoke battalions are probably formed from field gas companies, and consist of a headquarters and a number of companies, each about 220 strong. The headquarters is divided into executive, meteorological, signal, and first-aid sections. Companies consist of a headquarters and three platoons, each of three sections. Each section consists of an NCO and 23 men (7 of whom are drivers) and 6 one-horse carts. The section works in 4 groups of 3 men each, the remaining 4 men being used for intercommunication and protective duties. Four of the 6 carts each carry 6 boxes of "smoke" candles, while the remaining 2 carry rations and forage for 10 days.

The total number of candles carried by the company is reported as 3,240, but it is not certain whether this number applies only to the special smoke (arsenical toxic smoke) candles or to the ordinary smoke and green-gas (CAP nonpersistent lachrymator) candles as well.

d. Infantry Regimental Smoke Companies

Temporary smoke companies of infantry regiments are formed from ental personnel trained for these duties, and are employed for specific perations only. The company is organized into a headquarters, similar to a rifle company, and three platoons, each of 4 sections. Sections consist nen organized as leader, assistant, and 3 groups, each of 3 men. Detailed zation is as follows:

	Personnel	Horses	Vehicles	Materials
ny Hq	12	1	- -	- -
ons, each	51 (includes platoon commander and 6 drivers)	6	6	36 boxes (540 candles)
Total	165	19	18	108 boxes (1,620 candles)

e. Gases

Blister, choking, nose, and tear gases are all likely to be used.

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(1) Blister Gases

Mustard (HS)	Used in aircraft bombs and spray; shells, mines, and in ground contamination apparatus.
Lewisite (MI)	Used in aircraft bombs and spray, and in shells, Generally mixed with mustard to lower freezing point.

(2) Choking Gases

Chlorine	Used in cylinders.
Phosgene (CG)	Used in aircraft bombs, mines, shells and cylinders.
Diphosgene	

(3) Nose Gases (toxic smokes)

Adamsite (DM)	Used in aircraft bombs, shells, generators, and grenades.
Diphenylchlorarsine (DA)	Used in generators.
DC	Used in generators.

(4) Tear Gases

CAP	Used in aircraft bombs, shells, generators, and grenades.
Bromoacetone	Used in hand grenades.
BBC	

(5) Miscellaneous

HCN (hydrocyanic acid)	Used in shells.

Experiments in the practical uses of the following gases have been carried out at the Army Chemical Laboratory in Yodobashi, Tokyo:

Phosgene and diphosgene

Mustard gas (dichlordiethyl sulphide)

Palite (chlormethylchloroformate)

Diphenyichlorarsine

Lachrymator (brombenzyl cyanide)

Smoke (SO_3, Phosphorus, etc.)

Incendiary mixtures (thermite, etc.).

INFANTRY

11. NOTES ON THE BURMA CAMPAIGN

The following observations are taken from British sources which summarize the experience gained from the campaign in Burma. The lessons drawn from this campaign must be viewed in the light of the conditions under which the fighting took place: outnumbered United Nations forces were conducting a very difficult retreat, in country which was mainly jungle and where many natives were Fifth Columnists.

a. Training for Jungle Warfare

The British report emphasizes that, for troops unfamiliar with the jungle, first contact with this type of country is confusing and even frightening. The Japanese capitalized on this by the use of fire-crackers and "battle cries" to add to the effect of jungle noises. Troops who are to operate in jungle country should be trained as far as possible under conditions which will familiarize them with this type of terrain.

The report recommends that troops be trained in the use of battle cries, both for purposes of controlling movement and for the psychological effect on enemy morale. The Japanese have made effective use of this device.

b. Movement

The Japanese made little or no use of scouts during night movements, and in some cases they advanced without putting out patrols ahead of their columns. The Japanese were also careless in moving motor transport and normally gave their approach away by failing to dim the headlights.

In the second half of the campaign, the Japanese moved by night and rested during the day. During this period, they made very inadequate provision for security of their bivouacs and were easily surprised during daylight.

c. Fifth Columnists

These were used extensively, sometimes as patrols moving ahead of

advancing Japanese forces and sending back information. British ambushes were nearly always given away to the enemy by Fifth Columnists.

d. Japanese Shock Troops

These are killers, trained in individual fighting, self-reliant, and bold to the point of fanaticism. Moreover, they have a very good sense of guerrilla tactics and are capable of effective action in groups. They are masters of the art of concealment and camouflage, and very quick to size up a tactical situation.

Usually armed with light automatic weapons, their sniping has sometimes been deadly, but it is reported that, on the whole, their marksmanship is not adequate to enable them to reap the full benefits of their excellent offensive tactics.

The shock troops are employed primarily for infiltration. They sift through forward lines before the main Japanese forces come up, pin down advance units, and cause confusion in rear areas by seizing key positions quickly and boldly.

The British regard it as of the highest importance that these shock troops be dealt with as quickly as possible, by what is termed a "blitz" party. They recommend that this party be commanded by an experienced officer, often the company commander, and in medium jungle country that the party include two light machine guns and three Tommy guns. The party is formed under cover, and moves to a line of departure as near as possible to the area in which the enemy has been located. From this line, the party advances, shooting from the hip, and spraying all possible enemy positions with short automatic bursts, or two or three rounds of rifle fire. The light machine guns should have tracer ammunition. Muzzles are kept well down for ricochet effect. Any houses and trees in the line of advance must be sprayed with fire. In order to avoid loss of contact between elements of the party and to insure a ready supply of ammunition, care must be taken not to advance too far. It is reported that the Japanese will not stand up against shock tactics of this sort. It is further suggested that "blitz" parties should be made up on the spot from available troops at hand rather than organized as specialist groups; if specialist groups are formed it is feared that they will often not be present at the right time or the right place. Therefore, all riflemen should be trained to participate in a tactical group of this sort.

Emphasis is placed on the need for heavy automatic-weapon fire in jungle warfare against the Japanese shock troops. To meet the automatic weapons of the enemy, the heaviest weight of fire power must be used, and used first.

The British report of this campaign expresses the belief that if the Japanese shock troops can be successfully dealt with, there is less to fear from the action of the main forces.

e. Japanese Pursuit

It is reported in this campaign that the Japanese failed noticeably in aggressive pursuit of withdrawing United Nations forces. This failure was presumably due either to orders which limited forces to a particular objective, or else indicated lack of initiative in pursuit tactics.

f. Mortars in Jungle Fighting

The Japanese 4-inch mortar proved a formidable weapon in jungle warfare. It was brought up very quickly after contact was established, and fire was accurate.

The Japanese avoided siting their mortars on the edge of a jungle or wood. They were generally placed well back from the edge, even as far as 400 to 600 yards. This meant that observation posts must have been well forward of the mortar position, and it is thought that these posts must have controlled the fire by light radio sets or by telephone.

It is reported that the Japanese do not stand up well to shell fire and that mortar fire is very effective in silencing Japanese mortar posts or machine-gun posts. The value of searching fire directed against Japanese light machine guns, mortars, and artillery was very noticeable. On many occasions searching fire of 3-inch British mortars, with variations in range, and deflection shifts of 2 to 10 degrees, had the effect of completely silencing enemy positions over long periods. The British give the following recommendations with regard to use of the mortar:

(1) It is an extremely valuable weapon for the jungle, often being the only support weapon which can deal with short-range targets.

(2) Movement of mortars in jungle country presents a serious problem. Except on main roads the mortars cannot be moved by motor transport. Pack mortars are liable to be lost through the stampede of animals under fire. Jeeps are recommended as the ideal transport vehicle.

(3) Even at night, mortars should be sited away from the edges of jungle clearings or isolated woods in order to avoid being spotted by muzzle flash and neutralized by enemy mortars. The Japanese have often been able to locate machine-gun and mortar positions by patrols and then bring accurate fire at night on these positions. The patrols indicate the position of the weapons by converging fire with red tracer ammunition.

(4) In selecting the mortar position, care must be taken to insure a field of fire clear of tree boughs for a wide traverse. A 15-foot screen of foliage in front of the line of fire will screen the muzzle flash.

(5) The observation posts for direction of mortar fire should be pushed up to the edge of the jungle and should operate by some simple form of visual

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signal.

(6) The initial laying of the mortar can be accomplished either by the detachment commander at the mortar position, or by sending a gunner forward to the observation post to get range and direction. The opening fire must be at safe margins and corrections boldly made.

(7) In difficult positions, communication from the observation post will be facilitated by clearing tunnels through the jungle. This must be done in such a way as to conceal the tunnels from ground or air observation.

(8) If the rounds fall in high jungle, observation of the fire may be completely blanketed. Where this is the case, systematic searching fire must be used instead of corrected fire.

(9) Smoke ammunition may be used in the jungle to set a dry area on fire, but it is suggested that incendiary ammunition would be much more effective for this purpose.

(10) The small 2-inch mortar is also a good jungle weapon.

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12. JAPANESE OPERATIONAL PRINCIPLES: MANDALAY OFFENSIVE

The following document, dated March 26, 1942, was found on the corpse of a Japanese battalion commander, and its importance is indicated by the reminder, over the signature of the Chief of Staff of the Army, to the effect that "this document must be carefully protected."

The document starts out by highlighting the objectives to be sought by the Japanese in this campaign, and goes on to enumerate the several steps necessary to bring about a decisive battle in the Mandalay area.

The full text of the instructions follows:

a. Objective

The objective of our Army in this campaign is to crush the combined forces of the British and Chinese, especially the latter. This is to prevent their cooperation, and to consolidate the whole of Burma.

Our army is now fighting to bring about a decisive battle for the South Area Army Forces. Once we succeed, we shall not only check the ambitions of the British in the Far East, but will also deliver a crushing blow to Chiang Kai-Shek's administration, and speed his downfall. Otherwise, if we lack thoroughness in dealing with the enemy, and the battle is a long one, the effect on the Greater East Asia war will be considerable.

All ranks in the army should be taught thoroughly the significance of this campaign and our responsibility.

b. Plan

Before coming to a general engagement, the army should try to catch and annihilate the enemy in their individual areas. But in general the army should either lure the Chinese army out, or force it to fight in the vicinity of Mandalay. Once this is done, the retreat of the main force must be cut off by a wide encircling movement. Meanwhile the enemy's attention must be held, and our frontal units should hold him from retreating until he is exhausted. Then the whole of our army in close cooperation will catch and destroy the enemy, whether encircled or isolated.

This can be called the fundamental plan of this campaign. However the enemy must also have plans; therefore, our fighting must be maintained according to prevailing conditions. It is of primary importance to fight according to this basic plan in order to attain the objective.

The intended encirclement of the enemy is of the greatest importance. When in contact, it must be found out if there is any possibility of the enemy's evading the encirclement. Here the circumstances are different from the conduct of operations in China. In this country, the local inhabitants are quite friendly to us and hostile to the enemy. Moreover, outside the encirclement areas, the country is rough and mountainous. Apart from the main roads, we can well say that there are no lines of communication. All these factors are handicaps to the enemy, and advantageous to our own fighting services. If there is any

sign of the enemy's withdrawing before we are ready to strike, we must lose no time in pursuing them so as to fulfill the objective of our fighting plan.

c. Methods

The following points are to bring about the above plan, and are to be understood by all units.

(1) In order to complete the encirclement, the following points are to be memorized:

(a) Secrecy

Units that are assigned to build up the encirclement on the outer wing of the enemy's main force, should, before the general offensive of the army, maintain complete secrecy from enemy air or ground observation, by making use of terrain and darkness. Should they encounter the enemy, these units should encircle him and launch an immediate attack, and avoid giving any information which may lead to an estimate of our strength.

There have been many cases in which the enemy has been able to estimate our strength through movements of our troops in the rear. The secrecy of our rear movements must therefore be strictly maintained. Even in other sectors, although units are northward bound, we should not allow the enemy to overestimate our strength, lest this lead to an early withdrawal of the enemy's main force.

(b) Urgency of mobility

Ultimate success or failure in a battle depends on the mobility of the units that cut off the enemy's retreat. Once the offensive is on the move, then the units assigned to cut off the enemy's retreat must overcome all difficulties and occupy their objective at a given time.

For this purpose, these units should make full use of local transport organizations, but must not rely too much on these to the detriment of our fighting mobility.

When engaging the enemy, it is not essential to engage him frontally. A sudden flank attack will weaken his defense.

Units assigned to cut off the enemy's retreat are specially picked troops. Preparation for their transportation on short notice to their destination should be completed. After starting, these units should proceed directly to their destination if not harassed by the enemy. They must also, when on the march, maintain contact with other units following.

(c) Roads

The enemy is paying great attention to the construction of strong defensive positions on roads, but generally neglects the importance of the area on the sides of the roads.

Generally speaking, the British and Indian troops pay little attention to demolition of roads, as a result of which the thrust of motorized units is found to be particularly effective. Even the Chinese army seldom destroys Burmese roads as they do their own, since the local inhabitants are, generally speaking, hostile to the Chinese, and without the help of local inhabitants, destruction of roads cannot be fully achieved.

(d) Strongpoints

Units that are assigned to cut off the enemy's retreat must immediately consider the protection of the places they have to occupy. At the same time, they must maintain close contact with other units. They must be in a position either to attack the enemy or to defend themselves. Not one of the enemy must be allowed to escape, and the strong points must be held even if the enemy is attempting to break through from an advantageous position.

There is a common tendency among our troops to neglect the construction of strongpoints, especially protection against tanks and aircraft. When a place is to be protected, antitank obstructions should be erected. If engineers are attached, the construction will be more effective.

(e) Mopping-up

Mopping-up operations within the area of encirclement require time; therefore, the removal of troops from the enemy's line of retreat should not be done until the order is given.

(2) Important Points for Mopping-up Operations

(a) Aggressive Spirit

Not one enemy inside the encirclement must be allowed to escape, whether the operation takes 10 or 20 days. Everything to annihilate them must be done, and with no half-way measures.

(b) Use of Fighting Strength

In the campaign, close cooperation between air and ground must be maintained. Our forces must be concentrated according to time and conditions in order to defeat the enemy as quickly as possible. For this, the various signaling units must be suitably employed, and cooperation well planned.

(c) Air and Ground Cooperation

As the encirclement may extend several hundred kilometers, we require the cooperation of air units while the mopping-up is in full swing. During these operations, air and ground strength must be concentrated at one point, and therefore close air and ground cooperation is very essential. Any unit, under any conditions, must at once distinguish whether a plane overhead is ours or the enemy's, and, if ours, give the prearranged recognition signal. Units must not feel disappointed if it happens to be one of the enemy planes.

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d. Supplies from the Rear

Owing to the distances that have to be covered, and the rapid movement of first line units, supplies are usually overdue; therefore, provisions for the troops must be found locally. But as regards ammunition, troops must keep it secure and die with it. If they rely on supplies from the rear they will certainly lose fighting mobility.

e. Use of Local Inhabitants in Fighting Areas

The movements of the natives have a great effect on the outcome of a campaign. Units must exercise good discipline towards them. Propaganda and pacification should be started at the first opportunity, and everything must be done to induce the people to cooperate with us.

As regards the Burmese, we must respect and protect their temples, and thereby induce the monks to help us.

13. JAPANESE PARACHUTE TROOPS

Japanese parachute troops met with only limited success in the early operations of the current war. The Japanese themselves make very modest claims for their achievements, and admit frankly that the Parchute Corps must be greatly expanded and that more thought must be devoted to the training of these forces and their use in combat.

The first serious efforts toward creating a Parachute Corps in Japan were made in the late spring and early summer of 1941, when four parachute training centers were established at Himeji, Kasumigaura, Akitsu, and Koko (northwestern Taiwan). There were rumors and unconfirmed reports that as many as five other training centers had been established by October 1941. At least one was reported to be in the vicinity of Canton, China.

The four original fields were equipped with 400-foot parachute towers and were prepared to take care of the entire training of the paratrooper from his enrollment in the Corps to graduation with his unit. The other centers reported were said to be regular airfields to which parachute battalions were moved after the personnel had completed basic training. These were parachute training centers only insofar as parachute units were stationed there and conducted advanced training with air and ground forces.

The personnel which composed these units were men not over 28 years of age carefully selected from the infantry, engineers, and signal troops. The men were reported to be all volunteers, and undoubtedly many of them were; but in at least one observed case four men in one signal platoon were detailed without being given a chance to express their desires in the matter. One of these men, a sergeant, evinced a lively distaste for the work.

In the summer of 1941 the course of training lasted 12 weeks, but soon after it was cut down to 2 months, probably in an effort to speed up the expansion of the very small force then available for combat duty - some two and a half battalions. The trained units were broken up into cadres to absorb the new battalions, and when the war came in December the Japanese found themselves with a number of parachute battalions in training but only one composed of sufficiently well-trained men to permit its use at the front. Even this battalion had had little combined training with other ground troops or with the Air Corps, and had never participated in any large-scale maneuvers.

The original plan had called for a 3-month training period in China against an active enemy but "the sudden and unexpected outbreak of war," as the Japanese reports put it, prevented this valuable part of the training program from being carried out. (The real reason for the change was undoubtedly the desire for secrecy.) At any rate, the Parachute Corps, at the outbreak of war, was probably the one branch of the entire Japanese Army that was not fully prepared for action. Even the best trained battalion was kept out of fighting until the middle of February, when it became evident that the use of paratroops was the only hope of preventing the destruction by the Dutch defenders of the oil refineries at Palembang.

Palembang, an important oil-refining center situated on the Moesi River about 50 miles southwest of Banka Strait in southeastern Sumatra, became an objective of the Japanese southward drive on February 14, 1942. Dutch troops and RAF units defending the area were supported by British antiaircraft units grouped under the command of the 6th Heavy AA regiment. This regiment consisted of two heavy AA battalions, each armed with eight 3.7-inch guns; a light AA battalion armed with twelve 40-mm Bofors automatic AA guns; and an additional light AA company armed with three 40-mm Bofors guns.

The regiment arrived in Palembang on January 30, after having completed a period of training in England. This training had emphasized the employment of AA weapons and defense against ground attack, special units within the regiment having been drilled in antiparachute and antitank tactics.

At the time of the Japanese attack, the disposition of AA forces in the Palembang area was approximately as follows:

At the Palembang airport, 12 miles northwest of the city--eight 3.7-inch AA guns and seven 40-mm Bofors automatic AA guns. These guns were disposed in a perimeter for the defense of the airfield.

At the Shell Oil refineries at Pladjoe, immediately south of the Moesi River and 4 miles east of Palembang--four 3.7-inch guns and four Bofors guns.

At the Standard Oil refineries at Soengei Gerong, adjoining the eastern side of the Shell refineries--four 3.7-inch guns and about four Bofors guns.

The mission of the Japanese parachutists was divided into two parts: (a) to gain control of the airfield at Palembang; and (b) to seize the two large oil refineries there before they could be set afire or otherwise put out of commission. The airfield and the two refineries were so widely separated that the battalion had to be divided into three combat teams. Two hundred men were employed against each of the 2 refineries, while the remaining 300 made up the force attacking the airfield. Each of these forces had to operate independently and beyond supporting distance of the units attacking the other two objectives. The strength of the force employed, about 700 men, was insufficient by far for the task involved; at least 2 battalions should have been used.

The battalion, flying in 70 transport planes of the Lockheed-Hudson type, arrived over its objectives at 0830, February 14. Heavy bombers had carried out high-level bombing of the facilities on the airfield and of the wooded area enclosing the field to a depth of two or three hundred meters, but there had been no bombing or strafing in the vicinity of the refineries for fear of causing damage to the refineries themselves. This proved to be a serious error, as was the failure to strafe thoroughly the perimeter of the airfield with fighters and dive-bombers, for the Dutch force in this area was stronger than the Japanese had expected, and antiaircraft fire from the British batteries, unhindered by low-flying attacks, was so effective that the transports were unable to come down to what a Japanese officer called "a proper altitude for jumping." Many of the Japanese pilots had never been under fire before, and in their attempts to avoid the sudden heavy barrage from the ground rose too high and in many cases got off their proper line of flight. The result was that the parachutists were widely scattered when they alighted and had considerable difficulty in finding their leaders and organizing into combat teams for the assault on their objectives.

The plan called for the unit attacking the airfield to land on the field itself but as close to the protection of the woods surrounding it as possible. The men were then supposed to assemble by sections and fight their way around the perimeter of the field in both directions, converging on the hangars, shops, and other installations for the final assault. The groups whose mission was to seize the refineries were instructed to drop inside the enclosures and prevent the destruction of the facilities.

One group of the Japanese who landed in the vicinity of the airport immediately captured a Dutch armored car, with which they started on the road to Palembang. Using hand grenades, they killed the driver of a gasoline truck and the operators of several other vehicles. They then overturned these vehicles in the road, forming a block which they effectively covered with the fire of a light machine gun and so cut highway communications with the town. The crew of the armored car was eliminated by British machine-gun fire, but the road block was still covered by the fire of other parachutists.

South of the airport itself, numerous Japanese snipers climbed into trees near the antiaircraft position and fired upon the British gunners. The British finally cleared them out by firing the 3.7-inch guns into the ground in front of the trees. Later this gun position was again threatened by the enemy, who had

captured a Bofors gun, mounted a Japanese flag above it, and prepared to open fire. The gun, tractor, and Japanese crew, however, were quickly destroyed by direct fire from the 3.7-inch gun.

As soon as the snipers had been dispersed, the British attempted to withdraw the guns from the airport position. Only one prime mover was available, however, so that only two guns could be moved. After removing the strikers from the other guns, the crews abandoned them and slipped into the bush in an effort to destroy the Japanese light machine gun guarding the road block. Several attempts were made to silence the gun, but numerous snipers provided it with effective protection. Late in the afternoon the Japanese machine gun was finally silenced with the assistance of Dutch forces, and the two 3.7-inch guns, which by this time had reached the main road, were withdrawn in the direction of Palembang. Unfortunately, one of these had to be abandoned on the way, since light machine-gun fire had riddled the tires. Earlier in the afternoon orders had been given to withdraw the antiaircraft personnel from the airport to Palembang, and the movement was successfully executed, although it involved using extra men to protect the unarmed gun crews.

The airfield had come into the possession of the Japanese at about 1700 hours, when the defending troops withdrew toward Palembang. Only 30 parachutists were left of the 300 which had composed the original attack group in this area, and the Japanese admit that a counterattack during the night or early the next morning would have retaken the field without difficulty.

That night the Japanese light machine gun changed its position and again effectively covered a section of the road between the airport and Palembang. During the night most of the members of the AA Regiment fought their way back to Palembang, losing only eight men.

The attacks on the oil refineries failed utterly. Sixteen Japanese airplanes were destroyed by the AA defenses at the two refineries. The parachutists were so effectively engaged by specially trained squads that there was little interference with the demolition work, and by the time a huge sea-borne force captured Palembang the next day, both refineries were shambles.

At Pladjoe, where only a small number of parachutists actually landed inside the enclosure, the British AA antiparachute squad was the first unit to reach the refinery. They effectively engaged the Japanese and, aided by the arrival of the Dutch troops, brought the situation under control.

All of the parachutists attacking the refinery at Soengei Gerong came down outside the fence and were quickly disposed of by the alert ground-defense units holding this important plant.

The entire operation was characterized by the utmost confusion. Parachutists came down widely scattered because of the erratic course of the planes, the excessive altitude from which the men had to jump, and the slowness with which individuals followed each other out of the transports. Many men landed in

trees in the thick jungle and were unable to extricate themselves; equipment bags were lost in the dense forest and undergrowth; and only two radio sets were recovered undamaged. The men fought with tenacity and courage but this did not compensate for lack of experience in this type of fighting, coupled with the complete breakdown of command communications.

LESSONS:

Before executing a parachute attack definite information of enemy dispositions and strength must be obtained. This information must be kept up to date. The Dutch reinforced the garrison at Palembang 2 days before the attack and after the Japanese had completed their estimate of the situation.

The parachute attack should be preceded by dive-bombing and low-level bombing and strafing to neutralize local antiaircraft defenses so that the troop carriers can come in low over their objectives without interference. The high-level bombing carried out by the Japanese at Palembang destroyed RAF planes and facilities, but had little or no effect on the defending ground troops.

Troops and pilots should be so trained that parachutists can land in roads and other small cleared areas in woods and jungles. The Japanese troops at Palembang were helpless when they landed in the midst of thick jungle.

Equipment bags, radio sets, etc., should be carried and dropped with the group to which they belong. The Japanese carried all of their equipment in two planes. One of these was shot down and the other flew around dropping equipment indiscriminately. As stated above, most of this was lost.

The parachutists must follow each other out of the plane in rapid succession. Failure on the part of the Japanese to emphasize this point in training contributed greatly to the wide scattering of their men at Palembang.

Men must be trained to assemble on their leaders and to go into action as combat teams--not individually. The Japanese had met with so much success when they infiltrated small units behind the fixed defense lines of the British in the Malay peninsula, that they thought the same results would be obtained at Palembang. Here, however, they found strong posts scattered throughout the area, organized for all-around defense, with strong aggressive patrols working between posts. Because of their failure to assemble and because of the breakdown of communications, the Japanese were rarely able to concentrate enough force to overcome these strongpoints.

It should be remembered that the failures and omissions listed above apply to the first use by the Japanese Army of parachutists on a large scale. The Japanese Army is among the first to recognize its own weak points and to profit by its mistakes. It should not be assumed that these mistakes will be repeated. Although they met with only half-hearted opposition at Timor, the well-

timed and well-executed attack at that place is ample proof, if any is needed, that the Japanese learn fast.

Troops allotted to the static defense of the perimeter should be in posts sited for all-around defense. Parachute troops will land on all sides of the AA gun positions, and unless these sites are protected by a surrounding cordon of troops armed with automatic weapons and rifles the guns will soon fall to the attackers. Gun crews of antiaircraft weapons, both heavy and light, should be armed with rifles and submachine guns for the final defense of their positions. British AA and RAF ground personnel included a considerable number of unarmed men who had to be protected and who seriously hampered the actions of the few combat troops available.

A high proportion of the available troops must be kept as a mobile reserve. These men must thoroughly trained in jungle warfare. The role of such a reserve is to meet and destroy paratroops outside of the area of static defense. The initial position of these troops should be inside each strongpoint mentioned above and under the protection of its garrison. As groups of paratroopers are located, the reserve should move out and destroy them by aggressive action. When the mission is accomplished, the unit should reassemble, if possible, for further action inside the strongpoint.

Patrols or armored cars should operate between strongpoints as soon as the attack starts. They should be provided with some means of reporting the location of enemy groups to the nearest mobile reserve.

Routes of withdrawal and communication should be patrolled in sufficient strength to prevent the enemy from holding any portion of it for a long enough time to interfere with the movement of our troops or with the arrival of reinforcements and supplies. The Japanese placed a road block across the only road between Palembang and the airfield, and thereby effectively prevented the withdrawal of the guns around the field, as well as the arrival of reinforcements which had been ordered up from Palembang. The reduction of this road block, once it was established and protected by machine guns, was a long drawn-out affair. Had there been sufficient patrols on this road, the Japanese would have been routed while they were organizing the block, and much time and many lives as well as the guns would have been saved.

The air force ground staff should be trained and included in the ground defense "plan." Ground crews and other air force personnel must be armed, preferably with submachine guns, so that they can protect themselves and participate in the defense of their installations. There must be the closest cooperation between air force and ground defense headquarters. Problems of command and other matters which may give rise to controversy must be worked out in advance and thoroughly understood by all concerned. One of the greatest difficulties encountered by the British in this action was lack of coordination between the air commander and the CO of the ground defenses.

14. AXIS USE OF FRENCH MECHANIZED EQUIPMENT

At the time of the collapse of France, the equipment of the French Army was on the whole of excellent quality and type, and the factories of her industrial areas were keyed to wartime production. New prototypes were being evolved, and considerable research work was in progress. It was therefore reasonable to expect not only that large quantities of captured war material would come into general use in the Axis armies, but that the Germans would endeavor to swing the whole industrial resources of occupied France into the manufacture of advanced French designs, in addition to normal German equipment, for use by the Axis.

By February 1941, it was already clear that this was the case. The National Socialist Motor Corps was training drivers and mechanics for Germany's mechanized units on large number of Chenillette tracked carriers. These vehicles are very small tractors. They tow a tracked trailer in which an 81-mm mortar or a light antitank weapon can be carried. Being armored, they could be used in a role very similar to that of the Bren carrier, or as a tractor for antitank or infantry guns. In addition, it became known that French tanks were being sent to Germany; that damaged French tanks were being repaired for the same destination; and that manufacture of French types was continuing on a large scale in Occupied France.

In June 1941, there was a report that about 400 French R35 tanks in Germany were having the turret removed and replaced by an open-roofed armored box shield, in which were mounted a Czech 47-mm antitank gun and a coaxial machine gun. This arrangement was supposed to give a traverse of 50 degrees. The thickness of the shield was said to be 25 mm in front, 20 mm at the sides, and 15 mm in the rear. This report coincided with evidence of a somewhat similar alteration in the German Mark I tank.

The increasing tendency of the Germans to mount heavier guns in tank chassis extended, according to a report of July 1941, to the French 31-ton "Char B", which the Germans were said to have adapted by fitting a 450-horsepower engine and by mounting the very effective German 88-mm multipurpose gun. About the same time, according to a highly placed Axis industrialist, France had produced her five-thousandth tank for the Reichswehr.

Early in the Russian campaign, French R35 tanks were identified from a photograph in a German newspaper as forming part of the German forces. This identification was later confirmed by a report that French tanks were being used in considerable numbers. The only unit definitely identified, however, as being equipped with a proportion of R35 tanks is the 10th Reserve Tank Battalion, which uses them for training only.

It is also confirmed that large numbers of French tanks have been handed over to Italy, including the R35 and the obsolete FT type. The 2d Tank Battalion Renault R35 has been identified with the 4th Tank Regiment at Rome. There is also a battalion "Somua" with the 4th Tank Regiment at Rome, and it is known that the Somua S35 is being used by the Germans. A new version of the S35 known as the Char S40 was to have been made with a more powerful engine

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and a better suspension. Another Somua type is the SAu40, which mounted a long barreled 75-mm gun in the hull. Since the S.O.M.U.A. (Societe d' Ouillage Mecanique et d' Usinage d' Artillerie) factory in Paris is making tanks for the enemy, these types may possibly be in production.

Included in the general designation "R35" may be found an improved type with a better suspension, a more powerful Hotchkiss engine, and a slightly different silhouette.

It seems probable that French armored cars also are being used by the Germans. The first report came from a German prisoner, who described French armored cars with armament "just like a German Mark II Tank". The French Panhard 178 AMD 35 armored car is an 8-ton 4-wheeled type with 18-mm front and side armor and mounting one 25-mm quick-firing gun and one machine-gun. Recent evidence indicates that this car may be in course of adoption by the German armored division. Its speed of 50 miles an hour makes this type a very efficient vehicle for its intended purpose.

15. CHANGES IN UNIFORM AND HEADGEAR OF GERMAN ARMORED-FORCE PERSONNEL

During the past 2 1/2 years several changes have taken place in the distinctive uniforms worn by German armored-force personnel, armored-car personnel, and self-propelled antitank gun crews. The latest information indicates that these soldiers now wear the following types of uniform:

(a) Tank and armored-car personnel

Special black uniform, with a black field-service cap or a steel helmet instead of the beret formerly worn. Armored-car personnel may also wear a protective camouflage uniform of greenish drill similar to the black uniform.

(b) Armored troops other than tank and armored-car personnel

Ordinary field-gray uniform and a steel helmet.

(c) Crew of medium self-propelled antitank gun

A gray uniform of the same cut as the tankmen's black uniform, with gray field-service cap or a steel helmet.

(d) Pz. Kw. 38 (T) and medium armored troop-carrier personnel

Same uniform as tank personnel, but with the beret.

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16. BRITISH NICKNAMES OF TANKS

a. British Tanks

Nickname	Official Designation	Characteristics
Matilda (Medium)	Infantry Mk II	Heavily armored, slow, used with infantry for attacking prepared positions.
Valentine (Medium)	Infantry Mk III	
Churchill (Heavy)	Infantry Mk IV	
Covenanter (Medium)	Cruiser Mk V	40-mm gun, fast, long-range; standard tank of armored divisions.
Crusader (Medium)	Cruiser Mk VI	
Tetrarch	Light Tank Mk VII	Used with air-borne forces and for mountain warfare, reconnaissance, and protection of airdromes.
Harry Hopkins	Light Tank Mk VIII	

b. American Tanks

General Lee	Medium M3 with US turret	
General Stuart	Light M3	
General Grant	Medium M3 with British turret	
Ram I	Canadian-built	Same as U.S. Medium M3 except that 2-pounder replaces 37-mm gun in turret.
Ram II	Canadian-built	Same as U.S. Medium M3 except that 6-pounder replaces 37-mm gun in turret.
General Sherman	Medium M4	

17. INVESTIGATION OF FUMES IN ARMORED VEHICLES

It has been recognized for some time that tank crews face a danger from the collection, within the tank, of carbon monoxide fumes caused by the firing of the tanks' guns with the hatches closed. The Canadians are now conducting tests in a Ram II tank with an auxiliary ventilation system which it is hoped will completely eliminate this hazard.

The ventilating device consists of an exhaust fan installed under the ventilator in the roof of the main turret, and connected by a duct leading to a hood or intake attached to the ceiling of the turret at a point over the breech of the six-pounder gun. The exhaust fan is of the electrolux type and operated by a high-speed 24-volt motor. The most efficient design for the fan and motor was selected after various tests. The intake is located at a point in the sponge-rubber ring near the main turret hatch, over the recoil mechanism. The smoke is therefore exhausted from the vicinity of the commander's position, where repeated tests have shown that the gases tend to collect in a pocket under the cover plates when the tank is closed up completely.

The above auxiliary ventilation system was recently tested under battle conditions. During the firing tests, the hatches were completely closed. The ammunition used was service-type 6-pounder AP, with a full charge of nitrocellulose propellant. As a result of the tests it was concluded that the ventilating apparatus completely corrected the previously dangerous condition resulting from firing with hatches closed. The highest average of concentration of carbon monoxide gas during these tests was 0.09 percent, whereas in earlier trials of other ventilating devices the average concentration had reached 0.15 percent, or over, in every test.

Furthermore, in the previous tests the tank could not be kept fully closed throughout the duration of the trials, whereas in the present case there was no appreciable discomfort experienced in keeping the tank closed up until the average concentration of carbon monoxide had dropped substantially to zero.

MILITARY INTELLIGENCE

18. INTELLIGENCE FROM GERMAN PRISONERS OF WAR

The following article on methods of dealing with German prisoners of war consists of excerpts taken from a personal letter written by a British Intelligence Officer in the North African desert. This officer's notes are based on his work at headquarters of the British XXX Corps during the winter campaign of 1941-1942. A few changes have been made in unfamiliar British military terminology, but otherwise the excerpts are presented verbatim.

Of particular interest both to U.S. Intelligence officers and to any U.S. soldiers who may be taken prisoner are the illustrations of the tremendous amount of information which is unintentionally divulged by prisoners of war.

"In static warfare evacuation of PW [prisoners of war] was easy, because they went back through the normal supply channels to the cage and thence to railhead. The great advantage was that they could be intercepted at any point, and there was always a little transport to spare for carting around a few who were specially interesting.

"In the armored battle, when movement was generally very rapid, it was impossible to arrange anything cut and dried. Interrogation could not be done forward of the FMCs [field maintenance centers] because IO [intelligence officers] at Div Hq and below were much too busy with other duties. My own view is that a second IO is essential at Hq of an Armd Div.

"The shortage of tactical interrogators is very marked. The cages at FMCs and railhead were manned almost entirely by CSDIC [sic] personnel. This is not satisfactory, except in a few cases, because CSDIC people know nothing about tactics, and, with respect, nothing about tactical interrogation either. It is essential to have interrogators who can do the job without calling in gunners, etc., to be present at the interrogation and telling them what questions to ask. The idea that interrogators need not be soldiers should be buried forever.

"Arrangements for interrogation were haphazard. Sometimes a tent was provided for the interrogators at the cage, sometimes nothing. Some form of cover is essential at the cage even in mobile warfare, and in a campaign like this where two foreign languages are involved, the arrangements should be duplicated. It would be a great help if each pair of interrogators could have one car, driven by a batman-driver; this car should be of the Humber staff-car type with an office table in place of the rear seat. A typewriter is an enormous asset.

"During the armored battle, liaison with interrogators was almost non-existent (a) because the intelligence staffs of higher echelons were too busy with other jobs, and (b) because there was no direct means of communication. During the static operations, it was very good, because (a) intelligence staffs had more time; (b) the FMC, though not the cage itself, was on the end of a line, and we put the interrogators in the picture at least once a day; and (c) we sent the interrogators our intelligence summaries daily. Results in this case were first-rate, and each day we gave the interrogators a list of the points which were of most immediate interest.

"The technique of tactical interrogation as taught at X [in England] seems to me, if I may say so, to be excellent. German PW have run true to form. They nearly always respond (a) to someone who shouts at them, and (b) to show of knowledge. Many of them are comparatively secure about tactical information, but most of them will at least admit their units.

"The 'show of knowledge' worked with one Pionier, who unlike most of his countrymen had no Soldbuch [paybook] and no Erkennungsmarke [identification tag]. He refused to give his unit and was asked 'You don't imagine that we don't know what German sapper units are in Libya?' - he said 'Yes, I do',

but gave the name of his unit straight away as soon as the list of sapper units was reeled off to him.

"Other points which I have had a chance of verifying or discovering are (a) Never ask a leading question, (b) Don't ask too many questions one on top of the other, (c) If the PW doesn't answer a question immediately, always leave a longer pause than you think necessary; he usually says something in the end which will help the interrogation even if it doesn't give you any information, (d) Don't expect too much from interrogation. Training courses inevitably present interrogation as something a little spectacular. If a chap does produce a spectacular piece of information, go to great pains to check it; for this purpose it sometimes helps to deny what he says, so that he is obliged to give the reason why he knows, (e) Maps: out here at any rate it is practically useless to show a prisoner a map. The Germans apparently make little use of them; an Obergefreiter never has anything to do with one. If a PW starts to point out a route or a position on a map, he nearly always gets the scale wrong. It is best for the interrogator to have the map or the air photograph and to take some well-known reference point and then say 'You are standing here with your back to so-and-so. Now what do you see?' It is most important to cross-check any estimate of distance that a PW gives.

"I have held two parades of German PW, one of 16 men, and the other of 95. The words of command taught at X worked very well, and so did the idea of calling out the senior NCO and making him do the work. Here again a show of knowledge and authority helped a great deal. It was a good scheme to line them all up, tell them to place all their belongings on the ground in front of them and hold ready their Soldbuch and Erkennungsmarke. On the first occassion the old trick worked of saying 'Everybody in the 104 Lorried Inf Regt fall in over there'; on the other, after the fall of Bardia, I told the senior NCO, that rare specimen, a Hauptfeldwebel, to fall in the 95 other chaps according to units and, to my great surprise, he did it like a lamb.

"The Soldbuch was on the familiar pattern. Very occasionally a PW said he had handed it to the company office, and sometimes pages 3 and 4 were torn out. But practically always it gave the necessary information. All officers carried Soldbücher.

"During the operations at Bardia, Salum, and Halfaya, many PW did not carry paybooks. These had been taken away and kept with the Wehrpass at the company office, where, in many cases, they were duly found later on. Instead of a Soldbuch, PW carried a temporary certificate of identity giving the following particulars:

Rank, Christian name, Surname,
Date and place of birth,
Home address,
Date of arrival in Africa.

"The certificate was signed by the company commander and was stamped with the field post number. Identification was therefore possible in most cases.

"The certificate was typed on any piece of paper. When folded it was much the same size as a Soldbuch. A facsimile is reproduced below. Occasionally particulars of pay were entered on the back of the certificate, and in these cases the company commander's signature and field post number were repeated.

Vorlaufiger Personal-Ausweis.

Inhaber ist der ______________________________

(Dienstgrad, Name, Zuname)

geb am______________________________

wohnhaft in______________________________

(written in) Am. . . . . . auf afrikanischem Boden eingetroffen

(Official stamp) ....

(Unterschrift)

"Erkennungsmarken were of three kinds (1) showing the man's present unit - this was comparatively rare, (2) showing the man's ersatz unit - this was the most common, (3) giving a number, usually so far as I remember of five digits but not the field post number - this is evidently a new kind; very few PW have it.

"The field post number was invaluable as a means of identification. From quite early on, Army compiled a fairly extensive list, and this must have been of great help to regular interrogators. I think that in the first few days of a campaign it is most important that field post numbers should be reported with identifications.

"Documents were almost fantastic in their quantity and their value to us. Examples are (a) the capture by 30 Corps on D2 of a map showing the dispositions of all German units before D1; (b) the capture by 13 Corps of a valuable operation order, and (c) by far the biggest capture, the complete signals office of 21 Pz Div during the first week of the offensive. Minor examples are legion: war diaries, code names, photgraphs showing new weapons, training pamphlets, intelligence summaries, personal diaries, casualty returns and so on. Two things stand out from the IOs point of view; he must know Schrift as well as possible, and he should have a very good knowledge of German conventional signs; the Germans use them for marked maps, orders of battle, operation orders and vehicle markings, in fact wherever possible. If an IO knows them by heart he will save himself an immense amount of time.

"Out here almost all the organizations have something peculiar about them; but a knowledge of the normal organization helps a lot. I believe that it

would be a good aim to have everyone leaving X knowing the organization of the German Inf and Armored Divs backwards. An IO who knows his way about enemy weapons is invaluable.

"A knowledge of the main principles of tactics is invaluable, because the Germans are so consistent. I take back any mud that I may have thrown at von Cochenhausen! [See Tactical and Technical Trends No. 7, p. 22, and No. 8, p. 7.] This knowledge is particularly helpful when it comes to writing deductions for the summary."

ORDNANCE

19. NIGHT-DRIVING EQUIPMENT FOR GERMAN VEHICLES

Further details are now available on the operation of the special night-driving equipment with which German military vehicles are equipped and which was briefly described in Tactical and Technical Trends, No. 1, p. 21. It is believed that the equipment is sufficiently ingenious in its design to warrant a complete study at this time.

The equipment consists of the following parts:

(a) The blackout headlight. This is mounted on the left-hand side of the vehicle between 32 and 48 inches from the ground.

(b) The special interval-judging tail light, and stop light. This is carried on the left-hand side of the vehicle (see accompanying sketch, Fig.1).

(c) The additional tail light, fitted with a dimming device, and carried on the right-hand side of the vehicle (Fig.2).

(d) A five-stage dimmer switch on the dashboard (Fig.3).

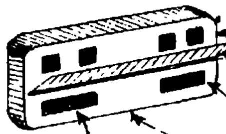
a. The headlight is of a peculiar flattened shape, and employs a horizontal 35-watt lamp which gives off light to the rear against a semioval mirror. This mirror in turn reflects the light back through a glass diffusion-panel under the overhanging hood. A soft, almost flat-topped beam of light results. The beam is projected for a length of 30 to 40 yards and a width of about 25 yards, and is particularly diffused toward the edges.

It is claimed that the beam from the headlight is invisible when on "low" from heights exceeding 1,600 feet; when on "medium" above 2,600 feet; and when on "full" above 4,800 feet. The same distances also apply to ground observation, horizontally.

b. The interval-judging tail light and stop light (Fig.1) consists of a panel divided into an upper and lower half. The upper half comprises the interval-judging device itself; the lower half consists of a normal red tail light, and

GERMAN NIGHT-DRIVING EQUIPMENT

FIG. 1



Rear Interval–Judging panel and Stop Light fitted on left hand rear of vehicle.

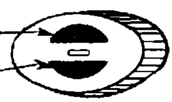
One bar of light (300-35 yd. distance) TOO FAR OFF

Two bars of Light (35-25 yd. distance) CORRECT

Four light rectangles (25-0 yd. distance) TOO CLOSE

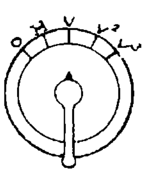
Left hand Tail light of vehicle with shutter "Down" i.e. using the Interval–Judging Device.

FIG. 2



Right hand Tail light with Alternative Dim and Bright Light.

FIG. 3



POSITION	HEAD-LAMP	REAR LIGHT
O	OFF	OFF
H	OFF	ON
V¹	LOW	ON
V²	MEDIUM	ON
V³	FULL	ON

Special Dash-Board Switch

a yellow stop light which functions when the brakes are applied. The half which is not in use is obscured by a shutter which is hinged about the horizontal axis of the panel.

The upper half of the panel, the interval-judging device, has four small rectangular windows, grouped in two pairs, and showing a yellowish-green light.

The operation of this device is based on the limitations of the human eye, which is capable of perceiving adjacent sources of light as actually distinct and separate only within certain distances.

Thus, at distances greater than 35 yards, the four rectangles of light will be perceived by the driver behind as one point of light. At about 35 yards distance, he will see two lights, and finally, when he is 25 yards away, all four rectangles of light will be visible.

All that is required of a driver in a column is that he keep such an interval between him and the vehicle ahead, that two points of light are always visible. Thus a column interval of 25 to 35 yards will be constantly maintained.

On the under-side of the housing which contains the interval-judging device is a shutter which, when opened, allows a dim light to be shed downward on the license plate.

c. The right-hand tail light (Fig.2) is compulsory under the German regulations, which require the vehicle-width to be indicated from the rear, as well as from the front. The fixture has two windows, one above the other, the upper one showing a dim light, the lower one a normal light. The change from one to the other is effected by turning a rotary shutter.

d. The Apparatus in Use

The degree of light can be varied according to the proximity of the enemy, by different switch positions. (See five-stage dashboard switch, Fig. 3)

STAGE 0 -- All lights out.

STAGE H - Blackout headlight out; only the interval tail light on. This is used when driving in column if the nearness of the enemy makes it necessary for vehicles to drive without the blackout headlight, or for the leading vehicle only to have the light on. Cannot be detected from the air, and on the ground not beyond 300 yards.

STAGE V 1 - Blackout headlight giving minimum light; interval tail light switched on. To be used on very dark nights when in the proximity of the enemy, and always to be used when driving into artillery positions, assembly points, etc. Cannot be detected

beyond 500 yards from the air or on the ground. On lighter nights, instead of V 1, Stage V 2 can be used without danger, but not in the immediate neighborhood of the enemy.

STAGE V 2 - Blackout headlight giving medium light; interval tail light switched on. To be used near and behind the front, e.g., when advancing to the front. Cannot be detected from the air or on the ground beyond 800 yards.

STAGE V 3 - Blackout headlight giving maximum light; and interval tail light switched on. To be used during blackout exercises in peacetime, etc. Cannot be detected from the air on on the ground beyond1,500 yards.

Where there is no actual danger of recognition by the enemy, vehicles can travel with the blackout headlight full on, and the rear license plate illuminated, as well as with the two tail lights and the stop light at their full strength. In other words, the dimming-switch will be at Stage V 3; the hinged shutter on the interval-judging panel will be up, covering the four windows of the interval tail light, and exposing the left-hand tail light and stop light; the shutter underneath will be open, permitting light to fall on the license plate; and the right-hand tail light will be set to bright.

At any sign of the enemy, it is necessary to stop the vehicle and to make the following adjustments before proceeding:

Push down the shutter on the interval-judging panel, thus exposing the interval-judging device. Close the shutter underneath, cutting off the illumination to the rear license plate. Rotate the dimming disk on the right-hand tail light.

The head light of the leading vehicle is switched down to the lowest possible point consistent with the darkness of the night and the danger of observation; the darker the night, the less light is used.

In convoys, only the leading vehicle will normally use its blackout head light, and all the remaining vehicles will switch to the H position, using the interval-judging panel to keep position.

 [redacted]

20. STANDARD GERMAN WEAPONS

The following list gives the more important characteristics of the standard German weapons now in use. The details given may contain slight inaccuracies, since a few figures are estimated, and many others have varied in different tests. The muzzle velocity of an old gun, for example, may be consid erably lower than that of a new one. Ranges, also, may contain some errors, for they have been taken from tables which reported figures sometimes as "range," at other times as "effective range," and at others as "maximum effective range," or merely "effective range." Usually there has been no indication of which of several possible propelling charges has been used.

Generally, the Germans give their weapons a model number corresponding to the last two digits of the year in which the first model was produced. Minor modifications make no change in the model designation, but a major improvement, even though the weapon remains basically the same, will give the equipment a corresponding new model number.

French, Polish, Russian, and other captured weapons have not been listed, nor have certain German weapons, such as heavy artillery, on which no details are available.

More complete details on the individual guns have been published in previous issues of Tactical and Technical Trends, and these articles will be continued in the future. A large amount of enemy materiel is now being examined at Aberdeen Proving Grounds, and the tests conducted there should provide the most complete reports yet available on all types of enemy armament.

The next issue of Tactical and Technical Trends will contain similar data on Italian weapons, and the one after that, information on Japanese armament.

STANDARD GERMAN WEAPONS

Weapon	7.92-mm rifle	7.92-mm carbine	7.92-mm machine gun	7.92-mm antitank rifle	9-mm submachine gun
German Name	7.92-mm Gew (Gewehr) 98	Karbiner 98 k	7.92-mm MG (Maschinengewehr) 34	7.92-mm PzB (Panzerbüchse) 38 and 39	9-mm MP (Maschinenpistole) 38 and 40
Caliber (inches)	.31	.31	.31	.31	.35
Muzzle Velocity (foot-seconds)				3,540	
Range (yards): Maximum			2,200 (bipod) 3,800 (tripod)		1,870
Effective	2,200	2,200	1,300 to 1,640 (bipod); 1,640 to 2,735 (tripod)		
Weight of Projectile	.43 ozs		.43 ozs	.51 ozs	.23 ozs
Rate of Fire (RPM): Theoretical			900	628	520 to 540
Practical			110 to 120 (bipod) 300 (tripod)	6 to 8	80 to 90
Remarks	Largely replaced by the carbine 98 k.	3 ft 7 1/4 in long.	Standard MG throughout army. Light MG when mounted on bipod; heavy MG when on tripod; air-cooled; 15 1/2 pounds without mount; barrel changed after 250 rounds continued fire.		Widely used. Magazine holds 32 rounds; several other types of submachine guns are used.

Weapon	9-mm pistol	20-mm AA/AT machine gun	20-mm tank gun	20-mm 4-barreled AA/AT gun	28/20-mm AT gun
German Name	9-mm Pistole 08 and 38	2-cm Flak (Flugabwehrkanone) 30 and 38	2-cm KWK (Kampfwagenkanone) 30 and 38	2-cm Flakvierling 38	2.8/2-cm SPzB (schwere Panzerbüchse)
Caliber (inches)	.35	.79	.79	.79	.79
Muzzle Velocity (foot-seconds)		HE 2,950 AP 2,625	HE 2,950 AP 2,625	HE 2,950 AP 2,625	4,700
Range (yards): Maximum		6,124 (vertical, 12,468 ft)	6,124	6,124 (vertical, 12,468 ft)	
Effective					
Weight of Projectile	.23 ozs	AP 5.2 ozs HE 4.08 ozs	AP 5.2 ozs HE 4.08 oxs	AP 5.2 ozs HE 4.08 ozs	AP 4.6 ozs
Rate of Fire (RPM): Theoretical		280	280	1680 to 1920 (4 barrels)	
Practical		120	120	700 to 800 (4 barrels)	8 to 10
Remarks	This and other models carried by many officers.	AP 40 penetrates 1.57-in armor at 90° at 100 yards; usually mounted on a half track.	Usually mounted on light tanks and armored cars.	Magazines of two guns can be changed while other two are firing.	Barrel has to be replaced after 400 rounds.

Weapon	37-mm AT gun	37-mm tank gun	37-mm AA/ AT gun	42/28-mm AT gun	47-mm self-propelled AT gun
German Name	3.7-cm Pak (Panzerabwehr-kanone)	3.7-cm KWK (Kampfwagen-kanone)	3.7-mm Flak 36	4.2-cm Pak 41	4.7-cm Pak Sfl (Selbstfahrlafette)
Caliber (inches)	1.45	1.45	1.45	1.10	1.35
Muzzle Velocity (foot-seconds)	2,500 to 3,380	2,500	2,755		2,620 to 3,000
Range (yards): Maximum	4,400	4,400	8,744 (vertical, 15,600 ft)		11,695 (vertical, 24,000 ft)
Effective					
Weight, Projectile	AP 1.68 lbs HE 1.37 lbs	AP 1.68 lbs HE 1.37 lbs	HE 1.37 lbs		AP 3.6 lbs HE 5.1 lbs
Rate of Fire (RPM): Theoretical					20
Practical	8 to 10	8 to 10	80 to 150		8 to 12
Remarks	Formerly the standard AT gun, still found in some units. Largely re-placed by 50-mm AT gun.	Formerly mounted on Mark III tank Largely re-placed by 50-mm long or short-barreled gun.		A new tapered-bore gun; no details are avail-able.	Mounted on Mk I tank chassis.

Weapon	50-mm tank gun	50-mm tank gun (high velocity)	50-mm AT gun	50-mm AA/ AT gun	50-mm mortar
German Name	5-cm KWK		5-cm Pak 38	5-cm Flak 41	LGrW (leichte Granatwerfer) 36
Caliber (inches)	1.97	1.97	1.97	1.97	
Muzzle Velocity (foot-seconds)	2,600	3,444	2,700 to 3,280		
Range (yards):					
Maximum					568
Effective					
Weight, Projectile	AP 4.56 lbs HE 3.94 lbs	AP 3.9 lbs	AP 4.56 lbs HE 3.94 lbs		2 lbs
Rate of Fire (RPM):					
Theoretical					
Practical	16		16		6 rounds in 8 secs.
Remarks	Mounted on most Mk III tanks; being replaced by long-barreled 50-mm gun.	Replacing the 5-cm KWK.	Standard AT gun. There may be a small number self-propelled.	No details available; the "41" may indicate a Guerlich principle tapered-bore gun.	At least one to each rifle platoon. Smoke and HE used; traverse, 16° right and left.

Weapon	75-mm tank gun	75-mm tank gun (new long-barreled model)	75-mm infantry and mountain howitzer	75-mm assault gun	75-mm mountain gun
German Name	7.5-cm KWK	7.5-cm KWK 40	7.5-cm LIG (leichte Infanteriegeschütz) 18 and LGeb IG (leichte Gebirgs Infanterie-geschütz) 18	7.5-cm StuG (Sturmgeschütz)	7.5-cm GebK (Gebirgskanone) 15
Caliber (inches)	2.95	2.95	2.95	2.95	2.95
Muzzle Velocity (foot-seconds)	1,600	2,400	725	1,600	1,000 to 1,250
Range (yards): Maximum	9,000		3,800	9,000	7,650
Effective					
Weight, Projectile	AP 14.81 lbs HE 12.56 lbs		HE 12 and 13.2 lbs	AP 14.81 lbs HE 12.5 lbs	12 lbs
Rate of Fire (RPM): Theoretical					
Practical			6		
Remarks	Standard armament on Mk IV tanks. Being replaced by long-barreled 75-mm gun.	Replacing the low-velocity 75-mm on Mk IV tanks. Penetrates 2.44-in homo armor plate at 30° at 2,000 yds.	Found in the cannon company of infantry regt. Being replaced by another model which has a range of 4,200 to 5,600 yards, depending on the weight of the shell.	Mounted on Mk III chassis. A new long-barreled model, the same as the long-barreled tank gun, is replacing this weapon.	

Weapon	75-mm mountain gun	75-mm light field gun	81-mm mortar	88-mm self-propelled gun	88-mm multi-purpose gun
German Name	7.5-cm GebGesch (Gebirgsgeschutz) 36	LFK (leichte-Feldkanone) 18	SGrW (schwere Granatwerfer) 34	88-cm Flak 18 (Sfl)	8.8-cm Flak 18,36, and 38
Caliber (inches)	2.95	2.95	3.2	3.46	3.46
Muzzle Velocity (foot-seconds)	1,600	715		2,750	2,750
Range (yards): Maximum	10,900	3,860	2,070	16,000 (vertical, 37,000 ft)	16,000 (vertical, 37,000 ft)
Effective			1,312		
Weight, Projectile	13 lbs		77 lbs	AP 21 lbs HE 20 lbs	AP 21 lbs HE 20 lbs
Rate of Fire (RPM): Theoretical				25	25
Practical			6 rds in 8 secs	12 to 15	12 to 15
Remarks			4 different propelling charges are used.	Not in common use	Cannot be used for AA unless taken off trailer.

Weapon	100-mm smoke mortar	105-mm AA gun	105-mm gun-howitzer	105-mm gun	150-mm infantry howitzer
German Name	10-cm NbW (Nebelwerfer) 35 and 40	10.5-cm Flak 38	10.5-cm LFH (leichte Feldhaubitze) 18	10-cm K 18	15-cm SIG (schwere Infanteriegeschütz)
Caliber (inches)	3.94	4.14	4.14	4.14	5.91
Muzzle Velocity (foot-seconds)		2,890	1,540	2,650	
Range (yards): Maximum		19,075 (vertical, 41,300 ft)	11,640	19,700	6,000
Effective					
Weight, Projectile	Smoke 16.2 lbs	HE 32 lbs	AP 34.62 lbs	HE 35 lbs	HE 80 lbs
Rate of Fire (RPM): Theoretical					
Practical		8 to 10			
Remarks	HE also used.		Standard light field artillery weapon.	Formerly 1 battery in each divisional medium artillery battalion. Actually a 105-mm gun, although called "10-cm."	Standard in infantry cannon company.

Weapon	150-mm medium howitzer	150-mm self-propelled howitzer	150-mm gun	150-mm smoke mortar	210-mm heavy howitzer
German Name	15-cm SFH 18 and 18/40	15-cm SIG (Mot S)	15-cm K 18	15-cm NbW (Nebelwerfer) 41	21-cm Mrs (Mörser) 18
Caliber (inches)	5.91	5.91	5.91	5.91	8.26
Muzzle Velocity (foot-seconds)	1,970		2,920		1,815
Range (yards): Maximum	16,400	6,000	27,200		18,300
Effective					
Weight, Projectile	HE 95.7 lbs	HE 80 lbs	HE 100 lbs		264 lbs
Rate of Fire (RPM): Theoretical					
Practical					
Remarks	Standard in medium battalion of German divisional artillery.	Mount is a Mk II light tank chassis.		HE also used.	

21. GERMAN SALVAGE PROCEDURE IN THE DESERT

It has been stated that Marshal Rommel, in planning his campaigns, puts great emphasis on the capture of British equipment and supplies, and that the acquisition of large quantities of such booty has been one of the important factors in the success of his past operations in North Africa.

The importance of captured materiel in the German supply system is illustrated by a field order issued by Rommel on May 23, 3 days before the start of the German spring offensive. The order states:

"The shortage of raw material and supplies in Africa makes it necessary to take every opportunity of seizing enemy equipment and supplies. Units may take with them only such amount of captured materiel as will not impair their operational readiness; all other booty will be dealt with by a special Salvage Section (Beuteberge-Abteilung) of Panzer Army Headquarters.

"A guard is to be left over all dumps and stocks. The Salvage Section will make arrangements for the security and removal of all dumps and will provide technical personnel and transport. It is to be in direct communication with the forward troops. Captured supplies are to be marked in light blue paint with the words 'Tedesco' (Italian word for German) and 'Erfasste Beute' (captured booty). Strong disciplinary action is to be taken in the event of any misuse or destruction of salvage."

On several occasions during the course of the offensive, it was observed that, at the conclusion of an engagement, enemy salvage parties appeared on the battlefield and began recovery of transport and antitank guns before the evacuation of prisoners of war had been completed.

On the other hand, the Germans are equally thorough in measures taken to prevent their own materiel from falling in serviceable condition into British hands. For example, German vehicles used in the desert are equipped with demolition or incendiary bombs, and drivers are instructed to destroy their vehicles prior to capture. Similarly in a recent visit to the El Alamein battlefield, it was noted that captured Axis tanks, motor vehicles, artillery, and antitank guns in large numbers had been destroyed prior to capture

SECTION II

SUMMARY OF OPERATIONS IN NORTH AFRICA, 1940-1942

SUMMARY OF OPERATIONS IN NORTH AFRICA, 1940-1942

Marshal Graziani's offensive against Egypt in September 1940 was the first of five campaigns which have been fought over the Western Desert.

This first offensive, starting from Bardia on the Libyan-Egyptian border, pushed only as far as Sidi Barrani in Egypt before it was halted by the British. The first British offensive (second campaign), launched in December, crushed any hopes Graziani may have had of moving on to the Suez Canal, for Wavell's troops not only accomplished their objective of pushing the Italians over the border into Libya, but moved on across Cyrenaica as far as El Agheila, where over-extended lines of communication finally halted the drive in February 1941. The second Axis drive (third campaign), against British forces depleted by withdrawals from the Balkan Campaign, introduced Rommel's Afrika Korps, which, with the Italians, drove the British to the frontier during March and April of 1941. Apart from the Battle of Salum in June, the front was relatively quiet, until the second British offensive (fourth campaign) in November 1941 again carried them to El Agheila, only to be pushed back by a heavy counterattack (January 1942) to the Gazala-Bir Hacheim line. In May of this year, Rommel attacked (fifth campaign) and forced a British retreat to the present Alamein positions.

In all this fighting, no clear-cut decision has been reached. Despite Axis domination of most of the Mediterranean, Britain still holds the Middle East, since a reinforced Eighth Army, massed on the short Alamein line, blocks Rommel's path to the Nile Delta.

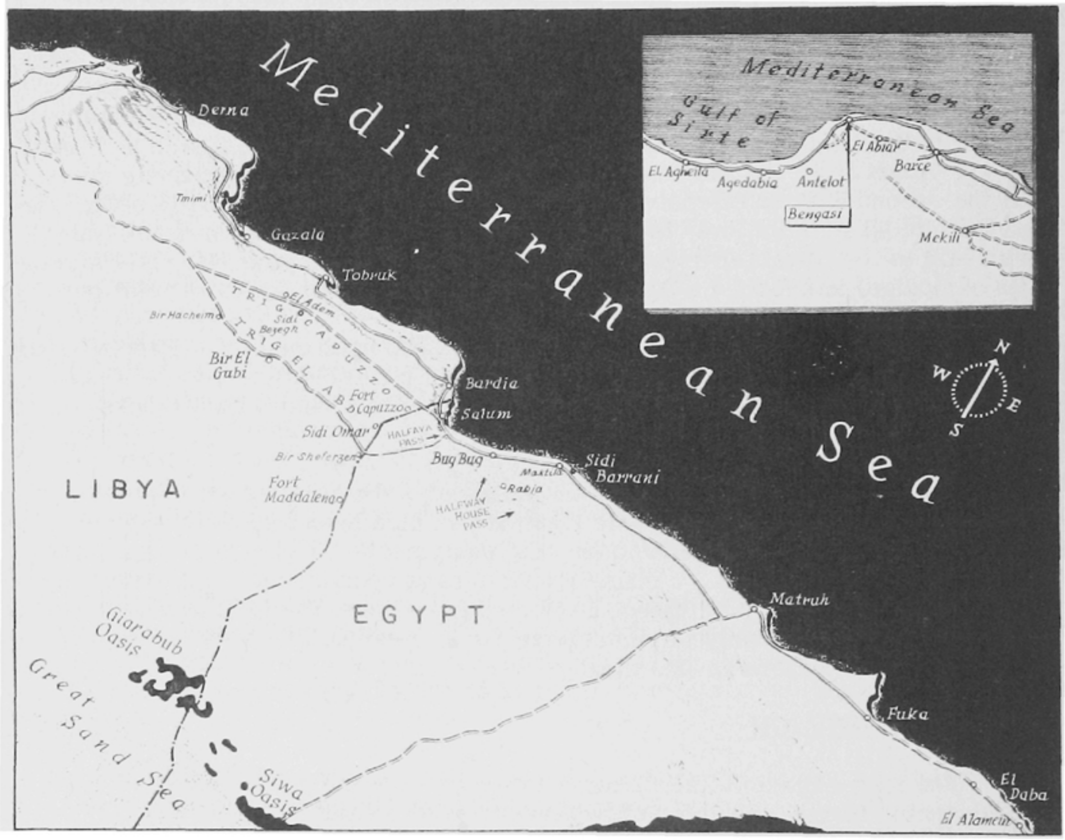
The desert has not only been the scene of a struggle for strategic control of the Mediterranean and the Middle East; it has also been a closely watched proving ground for tactics, techniques, and equipment--"a tactician's paradise and a quartermaster's hell." These subjects have been discussed in detail in this and other Military Intelligence Service publications; the following resumé of the fighting is intended only to summarize the five campaigns as a background for the future operations in this theater.

THE FIRST CAMPAIGN

The long-expected Italian assault on Egypt began on September 14, 1940. The advancing forces consisted of two mechanized columns of light and medium tanks heavily supported by artillery. The campaign, however, was of the nature of a British withdrawal rather than an Italian advance, and Salum, Buq Buq and Sidi Barrani were occupied by the Italians in a few days and without heavy fighting. Apparently the need for additional preparations prevented Graziani from attempting to push on to the next logical objective, the British railhead at Mersa Matruh.

THE SECOND CAMPAIGN

Forced to stop at Sidi Barrani, Graziani disposed his troops as follows: The 1st Libyan and 101st Blackshirt Divisions occupied Sidi Barrani itself and positions about 15 miles east of it. The 2d Libyan Division occupied positions



Mediterranean Sea
Derna
Tmimi
Gazala
Tobruk
El Adem
TRIG CAPUZZO
Bir Hacheim
Sidi Beyegh
TRIG EL ABD
Bir El Gubi
Bardia
Fort Capuzzo
Salum
Sidi Omar
HALFAYA PASS
Bir Sheferzen
Bug Bug
Maktila
Sidi Barrani
Rabia
HALFWAY HOUSE PASS
Fort Maddalena
LIBYA
EGYPT
Matruh
Giarabub Oasis
Great Sand Sea
Siwa Oasis
Fuka
El Daba
El Alamein
Mediterranean Sea
Gulf of Sirte
El Agheila
Agedabia
Antelat
Bengasi
El Abiar
Barce
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extending some 16 miles south of Sidi Barrani, while the 63d Metropolitan Division covered the escarpment from a point north of Rabia westward for about 18 miles. The 62d Metropolitan Division occupied Fort Capuzzo and, with the 104th Blackshirt Division, Salum.

Either the Italians assumed their defensive positions to be only temporary, or else they showed a rather naive concept of fortifications and security measures. All camp perimeters were clearly marked by loose stone walls about 2 feet high with a 2-foot trench in front. Little barbed wire was used, and along the perimeters, in line, were strung the rifles, mortars, machine guns, antitank guns, artillery, and grenades. Defense in depth, mutually supporting fire, outposts, and patrols were all lacking. Troops, stores, and equipment were kept inside the perimeter.

British troops, consisting of the 7th Armored Division (including two tank brigades and a support group) and the 4th Indian Division (3d and 11th Indian Brigades and 16th British Brigade), prepared to attack. The objective was to isolate and destroy all Italian troops east of a gap between the escarpment and the southern positions of the 2d Libyan Division. On December 9, 48 infantry tanks, followed by the 3d Indian Infantry Brigade on trucks, moved in against the northwestern perimeter of the southern positions at 0800. Although the British tanks met heavy defensive fire, they broke through the perimeter into the middle of a group of 25 Italian tanks, which they managed to neutralize. Indian infantry moved in after the tanks, proceeded to mop up, and captured about 4,000 officers and men. By afternoon, infantry tanks and the 11th Indian Infantry Brigade had moved north and captured 7,000 more prisoners in other positions south of Sidi Barrani.

The next British move was a direct assault on Sidi Barrani itself, executed by the three brigades of the 4th Indian Division from the south and southwest, and the 4th Armored Brigade from the west. A simultaneous move on Maktila was made unnecessary by the withdrawal of its garrison into the Sidi Barrani fortifications.

The attack was highly successful; the British captured 15,000 officers and men, while the 7th Armored Brigade and Support Group moved to the vicinity of Buq Buq, where operations against retiring Italian columns took 12,000 to 14,000 more prisoners.

Italian columns were attacked during the 12th by British tanks and armored cars, while the infantry of the 4th Indian Division spent most of its time attempting to handle the flood of prisoners.

Positions around Rabia were being abandoned, and the retreating Italians poured into the frontier defenses of Halfaya, Capuzzo, and Salum. RAF fighters attacked the retiring enemy while bombers dropped heavy loads on Bardia and Tobruk. At the frontier, the enemy defenses stiffened, and the Italian Air Force began effective action against the advancing British. Salum was taken on the 13th, however, and on the 14th, British armored-car patrols of the 7th

Armored Division and the Free French bypassed Bardia to cut the coastal road to Tobruk.

Bardia was still intact, except for damages from heavy bombing, and on the 16th the Italian frontier forces withdrew into its defenses, after evacuating their remaining positions in the Salum-Capuzzo-Halfaya area. From the 17th to the 21st, the 7th Armored Division and the Support Group moved to reinforce the patrol on the Tobruk road and to prevent a retreat from Bardia.

Bardia itself was fortified by three belts, consisting of a number of mines, concrete bunkers, and tank traps in addition to the familiar loose stone walls of the Sidi Barrani fortifications. While the foremost mobile British units began the encirclement of Tobruk, and the RAF bombed Bir el Gubi, Gazala, Tmimi, Derna, and Tripoli, the British prepared to assault Bardia. Elements of the 7th Armored Division blocked the road from Bardia to Tobruk, and the 16th British Brigade, plus the newly arrived Australians, attacked the southern perimeter at dawn on January 3, while the Support Group of the 7th Armored Division contained the western defenses Because of the stronger antitank defense, infantry and engineers preceded the tanks in the attack. Different sectors surrendered individually, but it was not until January 5 that the last Italians in the coastal area stopped fighting. Total prisoners for the operation amounted to 32,000 men.

British forces were already being reduced by withdrawals to Greece, but the British decided to push on. The Bardia attack had proved successful, and the same tactics, preceded by the reduction of outposts outside the actual perimeter, brought the fall of Tobruk. The British captured 20,000 Italians at the capitulation of that city on January 21.

The campaign's high spot came, however, on February 4, when the 7th Armored Division made a 150-mile dash from Mekili to Antelat, completely surprised the Italians retreating from Bengasi, and decisively defeated them. The campaign ended with the occupation of El Agheila a few days later.

THE THIRD CAMPAIGN

The advance elements of the German Afrika Korps debarked at Tripoli on February 12, and it soon became obvious that an offensive would be undertaken against the weakened British forces.

By March 31, when the Axis offensive actually started, British forces in Cyrenaica consisted only of about 40 armored cars, one armored brigade of 75 tanks (of which two-thirds were obsolescent light tanks or captured Italian tanks), 5 battalions of infantry, 3 weak regiments of light artillery, and a few antitank and antiaircraft guns--hardly a force to meet the threatened Axis offensive. When the Germans struck with a frontal attack on the forward British infantry positions in the north, and an enveloping attack along the edge of the salt marshes in the south, the British were forced to withdraw through Antelat to a position about 30 miles east of Bengasi. In addition to fighting rear-guard actions, the British had to contend with the difficulty of providing transportation from an ex-

tremely limited supply of trucks.

Communications had also broken down, and the armored brigade, as well as the 3d Motorized Indian Brigade in the vicinity of Mekili, was out of contact most of the time with headquarters. By April 6, German armored columns were advancing on the British left flank, where they engaged the Indian Brigade and threatened to outflank the main British force. The armored brigade had not arrived to reinforce the Indian brigade as planned, having followed the main body of British troops on to the coastal road; the Indian Brigade was defeated, and with the left flank gone, withdrawal all the way to the frontier was undertaken.

The withdrawal continued until the Axis forces had taken Salum and Halfaya Pass, leaving only an isolated Tobruk in the hands of the British.

THE BATTLE OF SALUM

The Axis attitude of passive defense, and reports of substantial withdrawals of German air strength from the Middle East, led the British into a decision to attack on June 15, 1941, in an attempt to destroy the German and Italian forces in the frontier area and relieve the besieged garrison of Tobruk. The British units available for this attack were considerably weaker than the total German and Italian forces in the Tobruk and frontier sectors, particularly in tanks and antitank guns. However, it was hoped that the Axis frontier defenses would be destroyed before reinforcements from the Tobruk area could be brought up. The British attackers were divided into three main groups: a Coastal Force, consisting of a brigade of Indian infantry, one platoon of tanks, an antitank company, and one regiment of light and medium artillery; an Escarpment Force, composed of an armored brigade, a battalion and a half of infantry, a regiment of field artillery, and antiaircraft and antitank units; and, third, an armored brigade group supported by a brigade of infantry. The first of these forces was to attack the Halfaya Pass position from along the coast, below the escarpment. This attack was to be supported by a portion of the Escarpment Force (second column) from above. The third column, with the remainder of the Escarpment Force was to move on toward the fortified positions along the border and then attack Fort Capuzzo and Salum.

Except for the failure of the Coastal Force to capture the Halfaya Pass position, the British plans for the initial phases were carried out successfully. The Escarpment Force, made up of the 4th Indian Division and a tank brigade, with other units attached, proceeded to the wire fence at the Libyan--Egyptian border and launched successful attacks on small fortified areas and on Fort Capuzzo and Salum. The 7th Armored Brigade and the Support Group protected the left flank of the 4th Indian Division as ordered. The 7th Armored Brigade, however, was driven out of its position in the northwestern sector by superior numbers of tanks of the 15th German Armored Division, and the Support Group in the southwestern sector was outnumbered by the motorized and armored forces of the 5th German Light Motorized Division, which included a battalion of 86 tanks.

Threatened with an enveloping movement against his weakening flank, the commander of the 4th Indian Division was forced to withdraw in order to prevent his lines of supply and communication from being cut. The decision to withdraw was also influenced by the fact that the Coastal Force on the right flank, in spite of determined assaults, had been unable to take the Halfaya Pass position and join the forward units. The withdrawal was completed on the night of June 17. The Axis forces did not pursue the retreating British, probably because the opening of the German offensive against Russia was only 5 days off.

THE FOURTH CAMPAIGN

By the middle of November, the British Eighth Army had accumulated the requisite strength for an offensive, and on the night of November 17-18 the British 7th Armored Division, the 1st New Zealand Infantry Division, and the 1st South African Division (less one brigade) crossed the frontier wire to attempt an enveloping movement against the German armored troops lying between the Axis-held Salum area and the British fortress of Tobruk. The 4th Indian Division was given the mission of containing the Axis forces in the heavily defended frontier triangle, which included Bardia, Sidi Omar, Salum, and Halfaya Pass. From the 19th to the 23d, Axis and British tanks (including one brigade of 166 light U.S. M3's) battled to gain armored superiority, while the Tobruk garrison began, on November 21, to fight its way out of the ring of Italian infantry in an attempt to make contact with the British armored and infantry forces in the Sidi Rezegh area.

On the first day of fighting, November 19, the British 22d Armored Brigade successfully engaged the Italian Ariete Armored Division at Bir el Gubi. Meanwhile, the 7th Armored Brigade and 7th Support Group moved toward Sidi Rezegh, and the 4th Armored Brigade, with American tanks, engaged strong German tank units halfway between Bir el Gubi and the Omars. This dispersion of British armored forces was, perhaps, the most serious mistake of the campaign, for it enabled Rommel to strike the British units in detail and thus neutralized the initial British numerical superiority. By the night of November 21, the British tank units had been brought together at Sidi Rezegh, but by that time they were so depleted that the concentration brought little striking power.

During the tank actions, the 1st New Zealand Division had moved north and northeast, around the Omars, into Fort Capuzzo on November 20, and on to the Tobruk--Bardia road the next day. One brigade was left behind to contain Bardia, and the remainder of the division started to fight its way along the coastal road toward Tobruk, where they were to assist the garrison's attempt to break out.

The 4th Indian Division, in the frontier area, attacked and reduced the fortified Omars position on November 22. One infantry brigade, two squadrons of heavy infantry tanks, and most of the division artillery, used in the action were which netted much Axis materiel and equipment, and about 3,600 prisoners.

At the end of the armored battles, the Axis armored units were also heavily depleted; two days were spent in harrassing activities, until, late on the 24th, Rommel gathered all his remaining tank strength and made a drive toward the Omar-Sheferzen area. This seriously disrupted the British rear-area installations and caused a great deal of confusion, although few casualties resulted. Inconclusive actions continued throughout the next few days while the British brought in tank reinforcements and made repairs.

Finally, on November 26, the New Zealanders made contact with the Tobruk garrison, causing Rommel to withdraw his tanks to the north in an attempt to separate the Sidi Rezegh and Tobruk forces, which he did on December 1 and 2. More British reinforcements arrived, however, and, as the Indians and South Africans mopped up isolated resistances in the battle area, the strengthened 7th Armored Division renewed activities against enemy tank and infantry units.

It became obvious by December 6 that Rommel was withdrawing to the west, where he attempted to establish fortified positions: first, between El Adem and Bir el Gubi; and a few days later, in the Gazala area. These were finally reduced by December 16, and the Axis troops continued to withdraw, fighting successive rearguard actions until finally on January 7 the British occupied Agedabia.

On January 2, the 2d South African Division had made a highly successful tank and infantry attack on the isolated Axis troops in Bardia, taking 8,500 prisoners and liberating 1,150 British troops. A short time later Salum, and then Halfaya Pass, fell to the South African infantry after the isolated and weakened garrisons had been subjected to extensive and heavy bombardment by artillery and air.

The British 22d Armored Brigade had suffered heavily at Agedabia on December 28, and when the 2d Armored Brigade was defeated near Antelat on January 23, the position of the Eighth Army in the Bengasi area became untenable, and General Ritchie decided to withdraw to the east. There the British set up a mined and fortified line extending from Gazala to Bir Hacheim and started to build up strength for a new offensive. Axis troops also prepared for renewed attack, and little activity took place until the fifth campaign started on the night of May 26.

THE FIFTH CAMPAIGN

With his mobile Afrika Korps, Rommel moved around the fortified position of Bir Hacheim to attack the British armored units in rear of their minefield. Both of the German armored divisions and the 90th Light Division were used in the complete envelopment. The Italian Ariete Armored Division and Trieste Motorized Division halted at the southern end of the minefield to attack Bir Hacheim on the morning of May 27. The British, who had been led by extensive Axis demonstrations to expect a frontal assault in the northern sector, were not entirely prepared for the flanking attack; the 4th Armored Brigade, one

motorized infantry brigade, Headquarters of the 7th Armored Division, and some elements of the 22d Armored Brigade were struck in detail by the German columns before they could be concentrated to repulse the attack.

The 1st Free French Brigade at Bir Hacheim successfully repulsed the initial Italian attack, destroying some 30 to 50 enemy tanks.

During the next few days, heavy fighting continued east of the British positions, and slowly the British pushed most of the German armored forces up against the rear of the minefields. By May 29 the supply situation of the Axis armored forces was growing acute, for the RAF, the 7th Support Group, and the Free French at Bir Hacheim were effectively neutralizing all attempts to move supplies around the southern flank. Although the Italian Trieste Division had managed to open two small gaps opposite the armored concentrations in the Knightsbridge area, the British were moving to close this gap and did not feel that such narrow corridors could be effectively used for supply.

The Germans, realizing the necessity for opening an adequate route through the minefields, circled their armored forces in the so-called Cauldron with a number of antitank guns, and, turning their back to the British armored forces, they effectively attacked and destroyed British infantry units attempting to close the gaps. It would seem logical for the British to have struck the Axis armored forces from the rear with all available strength while this action was going on, but the British attack was delayed, and the initial gaps were widened to the point where they could be used for supply.

Indecisive fighting now took place for the next few days while the Germans first withdrew to the west through the gap, and then returned.

The next major action was the assault on Bir Hacheim. During the first week in June this position had been subjected to increasingly severe attacks by the Italians and some units of the German Armored Forces. Stuka dive bombers, heavy artillery (up to 210-mm), and concentrations of tanks were now used in an effort to reduce the fortifications. Realizing that this former flank position was no longer of any value to the British, General Ritchie gave orders on June 10 that it be abandoned. Heavy casualties resulted during the difficult evacuation, and by the time the Free French rejoined the British units only one-half remained of the original garrison of 5,000.

With the fall of the Free French position,the Germans units immediately fanned out in rear of the British, who were now forced to withdraw. The 1st South African and 50th British Divisions in the north were to be withdrawn along the coastal road to Tobruk, and all available British armored units were detailed to protect the southern flank for this withdrawal. This defensive line stretched from the Knightsbridge "box", held by the 200th Guards Brigade, to El Adem.

By this disposition, British armored units were tied down along an extended line and deprived of their mobility. This gave Rommel his chance to achieve a much-needed numerical superiority in tanks.

The British tanks attacked at dawn June 12, moving south from the escarpment. The groups of German tanks, however, successfully drew the British armor onto the 88-mm and 50-mm guns which were hidden in practically every small wadi, and among groups of derelict vehicles. After losing a number of cruiser tanks and American mediums, the British withdrew to their previous line along the escarpment. The Germans, attempting to conserve their own tanks, did not attack, but successfully brought their antitank guns within range of the British by sending forward one or two tanks which would weave back and forth and create a cloud of dust behind which the antitank guns were brought up. After the dust settled, the antitank guns would open fire at ranges of 1,000 to 1,400 yards. In firing at the American mediums, Axis guns concentrated on the vulnerable tracks and suspension system.

In addition to these new tactics, the Germans continued to lure British tanks onto emplaced antitank guns by sending forth small motorized infantry units as bait.

During the night the British tanks withdrew from the escarpment across the Trig Capuzzo, and took up positions before Acroma which they were to defend from direct Axis attack as long as possible.

On June 13 the battle continued, while the Guards Brigade evacuated the Knightsbridge box and took up positions near Acroma. The tank battle continued throughout the day with the Axis utilizing antitank guns rather than their armor; by the end of the day the British had lost all but 65 of the 300 or more tanks with which they had started on the day before.

In addition to these intensive ground operations, Axis dive-bombers attacked the British battle positions almost continuously during June 12.

The British were now forced to withdraw at least to the Libyan--Egyptian frontier, but after some debate it was decided that an attempt should be made to hold Tobruk. The situation, however, was not exactly comparable to that of the previous year when Rommel first pushed south of that fortress and isolated it. Because of a greater Axis control of the Mediterranean, the Royal Navy could no longer undertake to supply the port, and the German and Italian land forces were strong enough this time to make a determined assault on the fortress. In Tobruk were left the 2d South African Division, the Guards Brigade, the 11th Indian Brigade, one Brigade of the 1st South African Division, and at least five regiments of artillery. The main body of the British Eighth Army withdrew to the frontier.

Advance elements of the 90th Light Division pushed on toward Bardia and Sidi Omar; the main German and Italian forces prepared to assault Tobruk. The attack was preceded by intense dive-bombing and artillery preparation, and on June 20 Axis troops penetrated the southern sector; a few hours later a larger force pushed into the city itself through the Derna-road gap in the minefields. The surrender has been reported to have come some time in the middle of the morning, but many British units continued to resist, and the attacking forces did

not reach the harbor area until the middle of the afternoon.

With Tobruk gone, the main Axis forces pushed on toward the British frontier positions, and after brief fighting in that area the British decided to withdraw to Mersa Matruh where, reinforced by the New Zealand Division, they hoped to be able to make a stand.

On June 26 Rommel's two armored divisions and the 90th Light Division pushed in the British covering forces and prepared to encircle and attack Matruh. Again the British decided that the impending encirclement presented too much danger, and, now under the direct command of General Auchinleck what was left of the Eighth Army withdrew to the present position on the El Alamein line. Some British units were captured in the Matruh evacuation. By June 30, both sides had reached a line extending from El Alamein to the Qattara Depression. Heavy fighting raged along this line for several days, but because of stiffened British resistance and the Axis drive's loss of momentum, Rommel failed to advance further.

Since that time intermittent fighting to gain control of the "hills" of the position has taken place but neither side has attempted an all-out offensive.

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MILITARY INTELLIGENCE SERVICE, WAR DEPARTMENT

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SECTION I

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All correspondence pertaining to the bulletin should be addressed to the Dissemination Group, M.I.S.

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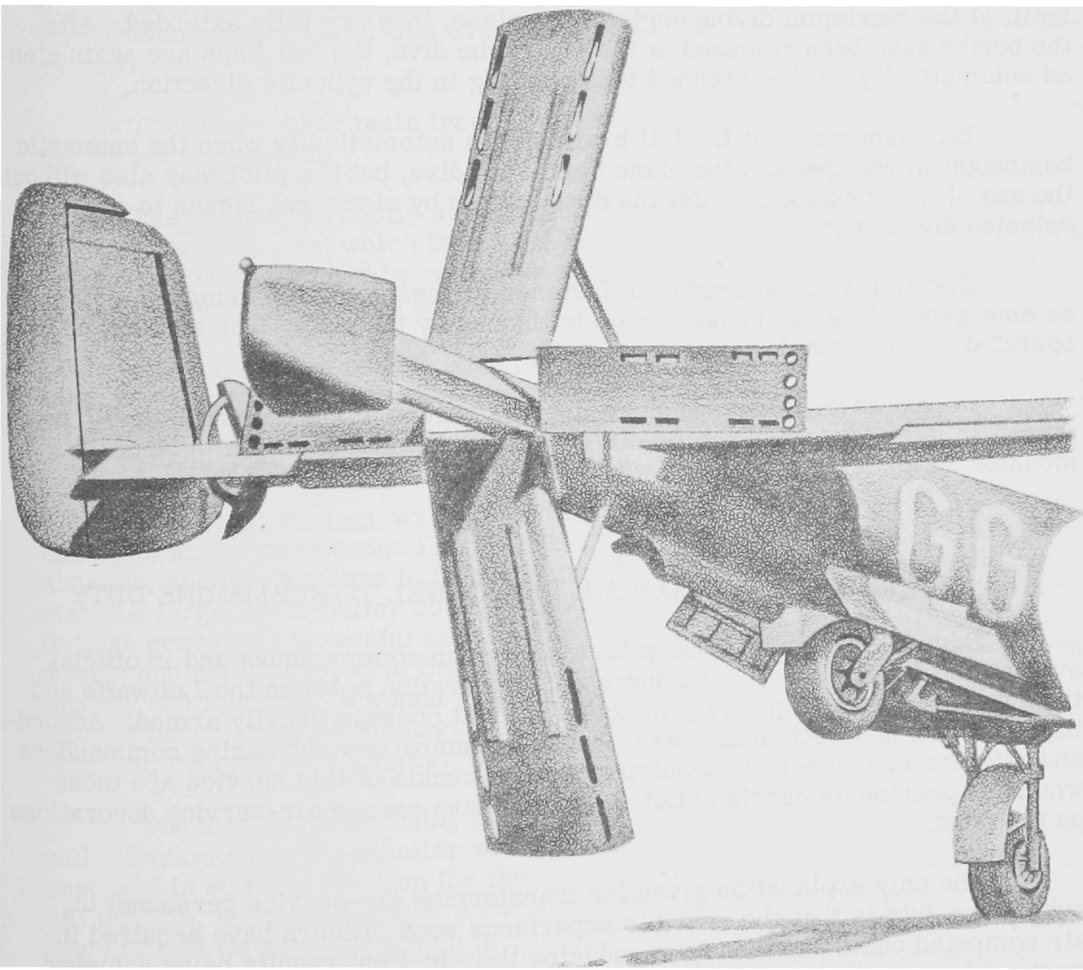
SECTION I

1. THE GERMAN AIRPLANE WITH AN UMBRELLA

Much has been written about the Dornier Do-217E but not until recently have details of its construction been known.

As can be seen from the sketch, one of the most interesting features of this twin-engined bomber is the tail dive-brakes. These brakes when closed form a "cigar-like" extension to the tail, causing it to look very much like the rear section of a giant grasshopper.



The dive-brakes consist of two pairs of flaps arranged at right angles to each other. In a fully extended position, the upper and lower or main flaps approach a vertical position, while the shorter and narrower horizontal flaps lie immediately behind the trailing edges of the elevators.

The rear ends of the dive-brakes are hinged to a threaded collar that rides on a threaded tube. They are centrally supported by four brace rods hinged at both ends. This arrangement produces the effect of an umbrella and has given rise to the expression "umbrella" or "parachute" bomber. Slots and holes along the edges of the flaps act as vents when the plane is in a dive. Upon entering a dive it is possible to set in operation an automatic electrically operated mechanism which turns the threaded tube and causes to travel forward the nut-like device to which the flaps are hinged. This opens the brakes gradually until, at the maximum diving angle of the plane, they are fully extended. After the bombs have been released at the end of the dive, the tail flaps are again closed automatically by the threaded tube rotating in the opposite direction.

It is assumed that the tail brake works automatically when the automatic bombsight is engaged and the plane begins its dive, but the pilot may also without the use of the bombsight adjust the dive-brakes by electrical means to any selected diving angle.

The entire tail assembly is fastened by means of four removable pins. In an emergency, this tail brake can be jettisoned by the pilot. The airplane is then operated in the normal manner.

Recent developments indicate that this brake alone is insufficient in steep dives. In later models of the Do-217E types additional brakes have appeared, mounted on the underside of the wings, inboard of the engines.

2. TRANSFER OF GERMAN AIR PERSONNEL TO SUBMARINE DUTY

Recent emphasis has been laid in German communiques and in official evaluation of them, on the high degree of cooperation between the Luftwaffe and the submarine arm, especially in action against convoys heavily armed. According to the German technical press, among the many new submarine commanders and officers who have been acquiring the war buckle of this service are those who have previously carried pilot wings and have earned air-service decorations on the front.

The only explanation given for transferring air-service personnel to submarine duty is that the valuable experience such officers have acquired in air command posts has aided in producing the excellent results being achieved by the submarines.

The possibility also arises, however, that physical disabilities which

disqualify an officer for active flight duty in the Luftwaffe may not render him unfit for service aboard a submarine.

3. GERMAN DEVICES FOR ASSISTING THE TAKE-OFF OF OVERLOADED PLANES

In order to increase the loads and ranges of their bombers and observation planes, the German Air Force has resorted to overloading. Once in the air, planes can fly with a considerable overload, although their speed is somewhat reduced; the main operational difficulty lies in the take-off. A normal take-off under overloaded conditions will require a runway of abnormal length; this is generally impracticable. The Germans have devised other means which have proven so successful that even smaller fields than heretofore are now being used.

There are three main types of assisted take-off: the catapult, the winch, and the rocket system.

a. The catapult is costly and complicated, and is not mobile. It consists of a dolly or car, upon which the airplane is placed. Upon a signal from the pilot, the car is hurled forward by compressed air, and the plane with its engines full-on is literally shot into the air.

The catapult is mainly used aboard ship where the take-off must of necessity be extremely short. The aircraft employing this method must be reinforced to withstand the sudden strain put upon it. The catapult has not proven itself very adaptable for ground operations.

b. The winch system was adopted by the German Air Force in 1940 primarily to assist overloaded Heinkel He-111 bombers in taking off from small airports, and now appears to be standard. This equipment is believed to consist of a large drum-pulley coupled by a clutch to a fly-wheel which is driven through gears by a powerful aero-engine. The entire device is mounted on wheels and can be moved to the required location by a tractor. A cable approximately 825 feet long is wound over the pulley and attached by a hook to a shackle underneath the fuselage. The tail of the plane is fastened by an electromagnetic coupling to a smaller winch.

The aircraft, after being placed in approximate take-off position, is pulled backward by the smaller winch until the main cable is taut; the plane is thus held in starting position for the take-off. After running up his engines to full throttle, the pilot presses a switch which simultaneously drops the tail coupling and engages the clutch in the main winch. The aircraft is pulled forward at a high speed and, as it rises and flies over the winch, the main cable is disengaged by its own weight. The clutch is thereupon automatically disengaged and a brake applied to the winding drum. Attachments found on planes

such as the Do-17 lead to the belief that devices of this or similar types are probably in general use.

c. The cheapest and most convenient form of assisted take-off is probably the rocket device now in use by the German Air Force on the Ju-88, Me-110, and other aircraft. It usually consists of two large pear-shaped rockets attached by special fittings to the underside of each wing. These rockets may have a venturi-type discharge nozzle and are believed to be activated by slow-burning cordite or some other fuel and compressed air. It is possible that if it is cordite, the powder is stowed in sections or layers which are progressively ignited by electrical means.

After a short take-off run the pilot presses an electrical switch, igniting the rockets; should the need arise, he may extinguish them almost instantaneously by turning off the switch. The thrust of these rockets lasts about 30 seconds. When the aircraft has risen about 500 feet, the rocket gear, which is quite large and heavy, is jettisoned and drops to the ground by parachute. It is believed that the rockets can be reloaded and used again.

While aircraft must be specially equipped to use this device, the apparent simplicity of the rocket method will no doubt increase its use for planes operating from restricted fields under conditions of overload.

4. GERMAN GLIDERS

A German glider tentatively known as the "Merseburg," with an estimated span of 178 feet, is believed capable of transporting 40 to 50 fully equipped men.

A model, possibly called "Goliath," with span estimated at 270 feet, probably could accommodate about 140 fully equipped men.

The Junkers Ju-90 transport is reported to have more than twice the capacity of the Ju-52. It is not new.

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5. GERMAN 105-MM ANTIAIRCRAFT GUN

Although it is probable that the Germans will retain the 88-mm gun as the main armament of their heavy AA artillery, due to its successful employment in the past and particularly because of its value as a mobile dual-purpose weapon, it is known that the 105-mm AA gun ranks high in German priorities for war production.

At present it is believed that the 105-mm gun is employed purely as a fixed weapon. A limited number of mobile mounts appeared at Hitler's birthday parade in 1939, but the mount proved to be unsatisfactory. Recent reports indicate, however, that a new tractor-drawn mount is being developed, and it is probable that the Germans intend to use this weapon in both an antiaircraft and antitank role.

Particulars of the 105-mm gun are as follows:

Muzzle velocity	2,890 f/s
Length of bore	60 cals
Maximum horizontal range	19,075 yds
Effective vertical range	36,700 ft
Rate of fire (practical)	8 to 10 rpm
Weight in action	11.56 tons
Elevation	-3° to +85°
Traverse	360°
Weight of projectile	32 lbs
Types of ammunition	HE with time fuze HE with percussion fuze AP shell

6. ANTITAIRCRAFT FIRE CONTROL BY RADIOLOCATORS

It is known that production of radiolocation equipment is being given a high priority by the Germans. There are indications that in many areas one radiolocation set is being employed to control the fire from several gun positions. In order to provide one set per gun position, a very considerable scale of production will obviously be required.

Equipment in use is believed to be highly developed from a radio point of view. Apparently, however, a corresponding degree of accuracy has not yet been attained in the method of transmitting firing data to the director. This latter problem can be expected to be a primary subject of German technical research in the immediate future.

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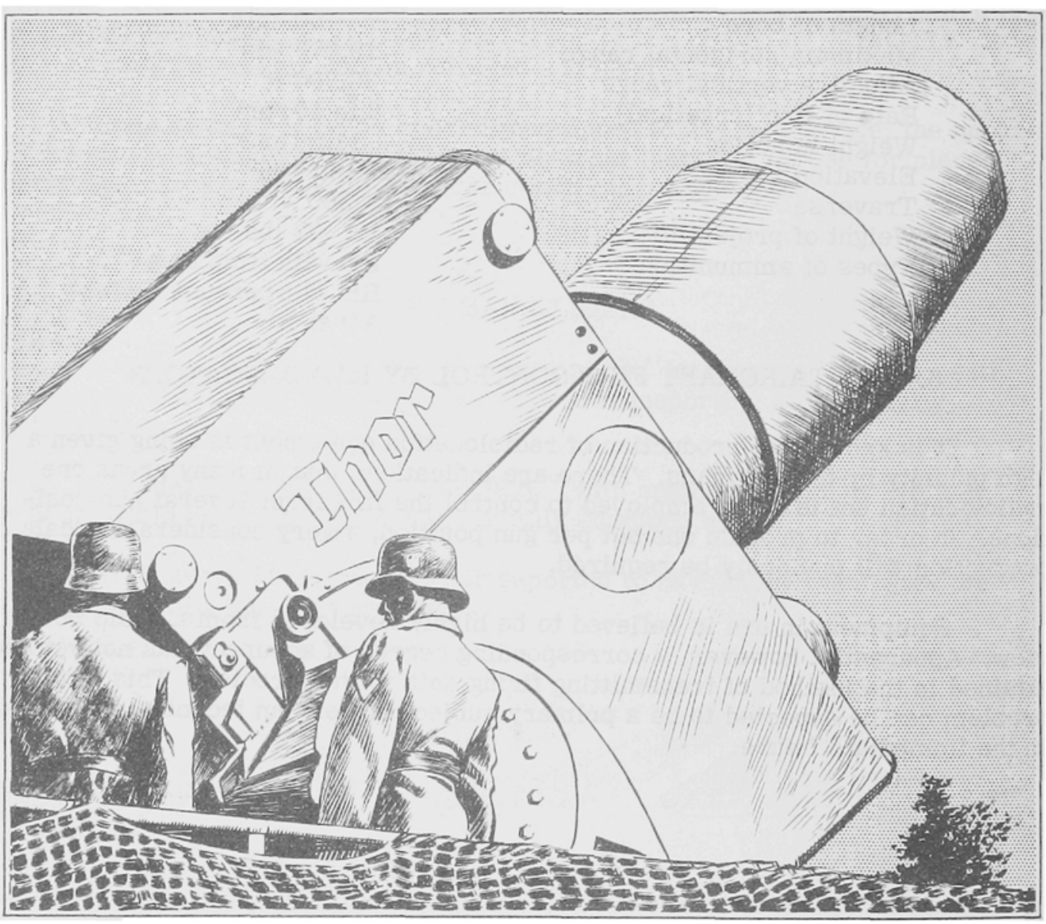
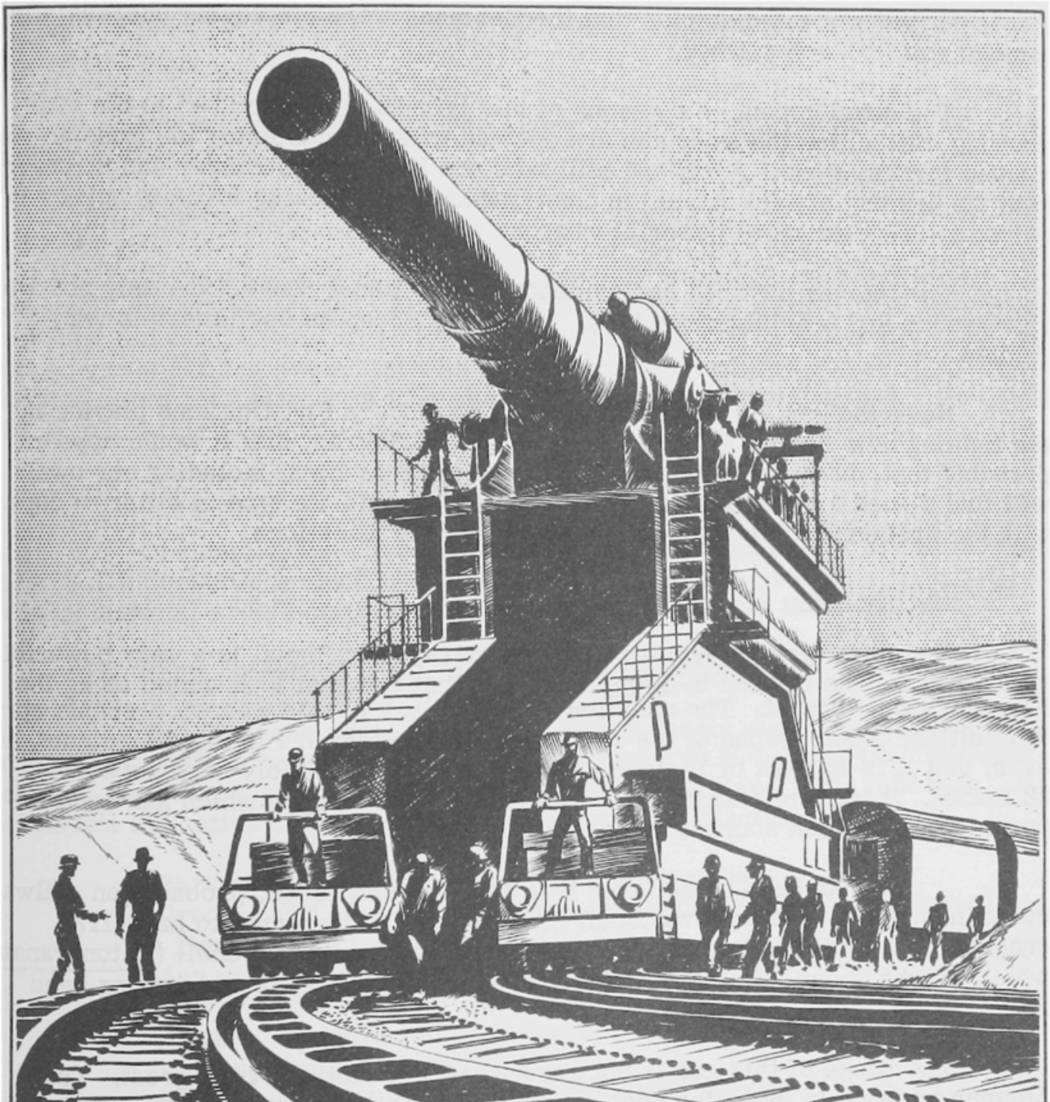
7. NEW GERMAN HEAVY ARTILLERY

Indications that the Germans have recently introduced two new specialized heavy artillery weapons are found in photographs and captions appearing in a recent number of the German magazine Signal. The two accompanying sketches have been prepared from these photographs.

a. Heavy Mortar

The mortar piece labelled "Thor" is stated in the caption to have been used in the Sevastopol siege operations. Other photographs appearing in the same number of the magazine depict this mortar mounted on a caterpillar tractor, from which it is being fired. An examination of this photograph by U. S.





artillery and ordnance officers resulted in a consensus of opinion that the caliber of this mortar was probably between 500-mm and 600-mm. It will be remembered that at the time of the Sevastopol siege, both the German and neutral European press printed stories that the Germans were employing successfully a mortar of 560-mm caliber.

The development of a weapon of this type is to be ascribed to the ever-growing difficulties the Germans are encountering in mastering the Russian permanent fortifications. Forts and pillboxes are becoming stronger and stronger with the passing of each month; in consequence the attacking force is being required to use ever more powerful weapons of offense.

The mortar pictured has evidently a very short range, certainly not over 5,000 yards and possibly much less. In consequence, its usefulness is very limited.

Nevertheless, so important a role are modern fortifications playing in the fighting now raging in Russia, notably at Stalingrad, that it would appear probable that, as the war continues to develop, all armies, including our own, will find a need for artillery mortars of this approximate type in order to cope with the problem of destroying permanent land fortifications.

b. Railway Gun

The other type of German weapon portrayed in Signal is a very powerful railway gun. The caption in Signal suggests that this gun is mounted along the French Channel Coast. The question of the caliber of this weapon presents some difficulties. Photographs of the shell appearing elsewhere in Signal indicate, however, that it is at least of 16-inch caliber, but more probably between 20 and 22 inches. It is quite possible that this is the same weapon which has been reported on by British sources as follows:

"It has been established that 61.5-cm howitzers, probably on railway mountings, were used at Sevastopol. This weapon is reported to have 112 grooves in the rifling, and to fire a base-fuzed 'anticoncrete' shell (Betongranate) which weighs about 4,400 lbs, is 6 ft 9 in long, and has a copper driving band 2.76 in wide."

The range of this gun is not known, but is doubtless very great. The German purpose in mounting such a gun in France is not at all clear. It would seem quite possible that it is primarily intended for the bombardment of London and other inland British cities rather than for fire against channel shipping.

8. JAPANESE DOCTRINE ON OBSTACLES

The following is a summary of a translation of portions of the Japanese Field Fortification Manual:

a. Electrical Obstacles

(1) Principle

Electrified wire is used to cause casualties to men and horses and to hamper hostile attacks.

(2) Construction

Normally, wire is strung on dry poles with bark removed, or on poles with all buried portions insulated with asphalt or coal tar. The bare wire is strung and connected with a high-tension source (1,000 to 2,000 volts AC), so that a person coming in contact with the obstacle wire closes the circuit. Transmission wires may also be strung along the ground, or under ground. (No details of the generating plant are given.)

(3) Use

Ordinarily, the current is not turned on except during actual attacks. A variation consists in electrifying certain sections of the wire during hostile reconnaissance, and electrifying additional sections during the attack.

(4) Reconnaissance of Hostile Electric Obstacles

The Japanese consider it important to locate electrical obstacles prior to an attack. Reconnaissance parties attempt to determine the characteristics of the source of power, and of the transmission lines. The following points are indicative of the presence of electrified obstacles:

Bark stripped off lower portions of wire obstacle poles.
Presence of asphalt cloth or other insulation around the buried portions of posts and pegs.
Any noticeable decrease in the number of wires, posts, and pegs.
Low wires free from contact with the ground.
Absence of additional loose barbed wire (used in some cases to strengthen obstacles).
Presence of insulators or transmission wires.
Burnt or smoldering grass close to wire lines.
Sparks when small-arms fire cuts the wire.

(5) Use of Detectors

The Japanese use several types of electrical detectors. One appears to be a simple voltmeter. Another type is a field telephone to pick up earth currents resulting from electric wire at distances of over 100 feet. Also mentioned are a magnetic induction detector with a range up to 1,300 yards, and an

improvised detector using a radio receiver amplifier with a range up to 500 yards.

(6) Destruction of Electrical Obstacles

Destruction is accomplished by demolition, wire cutting, and artillery fire. In some cases lines may be shorted by throwing water or brine on the posts. Bangalore torpedoes are the best means of demolition. After the use of both demolitions and artillery fire, loose wire ends are dangerous and must be avoided. Special squads equipped with rubber gloves, rubber boots, wire-cutters, and some type of nets for cutting paths through wire are trained in following up demolition work. No matter what the method of demolition, it is emphasized that a path wide enough for the passage of the attackers must be created, and all loose wire ends must be wrapped around posts. The resulting paths should be clearly marked.

b. Mines and Traps

(1) Mine Detection

The Japanese emphasize the necessity for studying the functioning of enemy mines and the enemy procedure for mine laying. Mine detection is generally a mission of technical troops.

(2) Elements of Detection

A detailed search for enemy mines should include attention to the following:

Those regions from which the enemy purposely keeps away.
Presence or absence of sentries.
Removal of civilians.
Intelligence re enemy's mine laying.
Change in color of soil, small swells, and mud cracks.
Exposures or traces of plates, wire, etc.
Any trip wire and rope on ground, or roads, or in forests.
Presence of poles and pegs whose use is unusual.
Waste paper or packing bits used in mine laying.
Mechanical noise coming from clock-run delay device.
Smell of chemical from chemical delay device.
Connection wire between obstacle and ground.
Wire connecting abandoned weapons and other booby traps.
Rocks scattered on roads.
Wire fastened to doors and windows.

(3) Probing Rods

A mine-detecting rod for probing is mentioned. Lacking other means, spades are employed.

(4) Mine Destruction

The Japanese prefer to remove discovered mines, but on occasion will mark located mine fields or will destroy mines by firing them.

c. Antitank Obstacles

(1) Types

The Japanese recommend use of the triangular trench, circular pit, and side-hill barriers for antitank defense. In the use of portable obstacles, two rows on level ground and single rows on steep slopes are suggested.

(2) Destruction of Obstacles

The destruction of steel-rail obstacles and side-hill barriers by explosives is recommended. It is suggested that generally it is best to fill trench-and-pit-type obstacles, using crib-work and earth-filled baskets.

Comment: It is recognized that this particular Japanese text deals with obstacles in a very superficial manner. This summary is presented in order to give a Japanese approach to the obstacle problem. Nothing has occurred in the war thus far to indicate a general Japanese weakness in dealing with mines or obstacles.

9. JAPANESE DEFENSIVE TACTICS IN THE SOLOMONS

The following are notes on Japanese defensive tactics encountered by our forces in recent actions in the Solomon Islands:

"Japanese trenches and shelters on the islands attacked by U.S. forces were skillfully emplaced under buildings and hedges. All dirt excavated in constructing shelters had been carried away so that detection of field works was very difficult.

"Telephone lines of galvanized wire were laid between Japanese strongpoints. Our shell fire and bombing had disrupted their communications. No evidence of visual signalling or arm and hand signals was observed. At night the Japanese used whistle signals, but their meaning was not established.

"Japanese weapons noted were rifles, pistols, light machine guns and grenades. Mortar fire was encountered on some islands but not on others.

"The flanks of Japanese positions and weapon emplacements were covered by snipers. Snipers were concealed in the tops of palm trees and were not detected until they opened fire, despite careful observation of tree tops. The Browning automatic rifle proved to be an excellent weapon for dealing with snipers.

"On several occasions, the Japanese were called upon to surrender but ignored the opportunity. Two Japanese were observed to throw down their rifles and run toward our lines with their hands in the air. Our forces ceased fire, but a Japanese machine gun shot down the would-be prisoners before they reached our lines.

"The Japanese made extensive use of natural caves, and replaced casualties at near-by guns from personnel in reserve in the caves.

"When grenades were first tossed into Japanese positions, the Japs threw them back. It was found necessary by our troops to release the firing mechanism and count to three before throwing, in order that grenades would explode before the Japs could throw them back.

"Fighting took place at ranges of 50 to 100 yards.

"The Japanese staged several small local counterattacks of 8 to 10 men led by an officer. The Japanese were nearly invisible but disclosed their positions by holding their rifles, with fixed bayonets, aloft while they assembled.

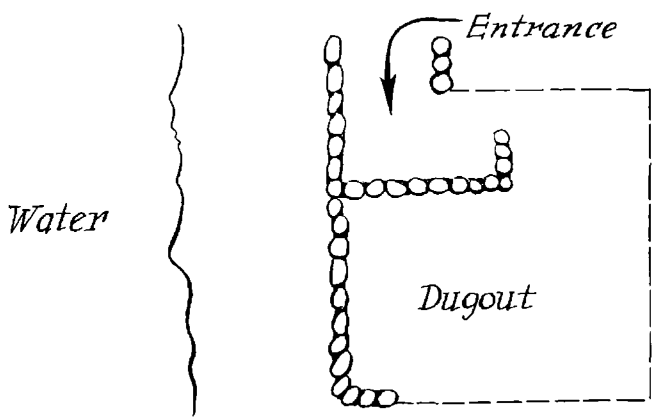
"The slit trenches employed by the Japanese gave excellent protection from bombing.

"When questioned about the lack of prisoners, a U.S. officer said that apparently a great deal of propaganda had been spread among the Japanese soldiers about the horrible things that would happen to prisoners.

"Naval gunfire and dive-bombing was still going on when the initial wave landed. No fire was received by this first wave, as all the Japanese had taken cover. After cessation of naval gun fire and bombing, the Japanese began firing from dugouts on the island and fire was received from an adjacent island.

"The first wave tossed grenades into the entrance to the dugouts that they passed. Although the grenades exploded within the entrance, it was later found that they were ineffective due to the type of entryway. Enemy troops fired from dugouts on the rear of the first wave and into the second and third waves, aided by snipers in the tops of coconut trees.

"Japanese dugouts were cut back into the hill on the island and were faced on the front and flanks with sand bags and steel plates. A U.S. sergeant sketched one of these dugouts as follows:



"The Sergeant stated that the Japanese fired from the entry of the dugout. Each dugout had about eight men in it.

"Fourteen dugouts were seen by the sergeant. He stated that they were close to the water's edge and were mutually supporting.

"The Japanese had installed no obstacles nor rigged any booby traps.

"One double-barreled light machine gun was captured. It fed alternately right and left from a central clip.

"The Japanese were very adept at concealing themselves. Some hid under their shelter halves and others under fallen palm fronds. One sniper shot down from a tree had coconuts hung around his neck to help conceal him. One sniper in a palm tree had protected himself with armor plate.

"No means of communication between dugouts were seen nor did the sergeant see any control exercised by officers or noncommissioned officers. Soldiers appeared to fight as individuals.

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"Japanese marksmanship was characterized as poor and not very dangerous if one kept moving and avoided lying in the open.

"It was emphasized that no flash, smoke or muzzle blast was visible from Japanese weapons and this materially aided the Japanese in remaining concealed.

"The Japanese snipers paid particular attention to picking off officers and noncommissioned officers whose exterior garments carried insignia or markings indicating their rank."

* * * *

Further information on the Solomon Islands campaign and on the tactics and fighting qualities of the Japanese soldier is contained in the following abstract of a personal letter from a Marine officer serving with our forces in the Solomons.

"I want to try and describe some of the characteristics of the Japanese soldier. Some of it may sound like so much hooey but it is an actual fact.

"Individually, he is a good soldier; in fact, an excellent one. They very, very seldom give up but will fight until killed, even after being badly wounded. Of a force of well over 700 that we wiped out, we were only able to take 34 prisoners, and 33 of them were so badly wounded that they couldn't do anything. We asked each one if they had been told that they would be killed if captured and they said "No," but that they expected to be. All insisted that they would never be able to return to Japan, so that probably is the answer.

"The first bunch that hit my right flank at 3 a.m. on the 21st, evidently didn't realize that they were approaching our positions. They were walking right in the edge of the surf and got tangled up in some barbwire that we had salvaged from fences. They started jabbering so our bunch let go with everything they had. They immediately rushed our positions and it was a grand mess for a few minutes. After driving them from our positions they took refuge right in the edge of the surf underneath a 3-foot bank and there they stayed about 50 yards from our line. By that time their main force closed in and tried to advance down the narrow sandspit; naturally, the slaughter was terrific. The rest of the main body had deployed on the east side of the river--about 100 yards from our lines--and a beautiful fire fight continued for many hours. They were well equipped with mortars, 70-mm cannons, flame-throwers, and heavy machine guns.

"There were probably close to 200 that were actually piled up along the narrow sandspit. The ones that were wounded would lie perfectly still but continued to snipe at us all during the day. We had one captain wounded by one even after we had, we thought, cleaned them out thoroughly. As we closed in through the mass of bodies, one man happened to step on a hand and he thought he felt it move so he kicked it. As he did, the Jap jumped up and tried to throw a grenade at a group near but the pin never came out. I actually saw dead Japs

with grenades in their hands with the pins pulled. Others that I saw had two or three wounds that had been bound up, but they stayed right there until the end.

"After it was all over, we saw one swimming well out to sea so we sent a boat out to get him. As the boat came alongside he made a dive and never came up. In other words, they kill or get killed. You must give them that credit.

"As you have been told before, they are great on sniping. After our initial landing, and after they had taken to the mountains, they worried us quite a bit, as they would slip in at night (or hide out during the day) and do a lot of firing. For two nights we actually had them running around inside Regimental Headquarters lines. As it was as dark as pitch we couldn't fire and they would outrun our boys. We had one sniper near our galley that would take one shot of a morning and one in the evening. We combed the fields and the coconut trees but we never found him. I am glad to say that he was a damn poor shot and he didn't get anyone before he finally beat it.

"Each Jap carried a camouflage net made of mesh with wood-fiber strands, and it is actually impossible to see them at 50 yards if they lie still with it on.

"The unit that hit us had landed 40 miles down the beach two nights before, so they had hiked and carried all of their heavy equipment that distance in less than 22 hours' hiking time. They hid in the brush during daylight. They had no food except what little each man carried and it was practically nil--I imagine they had eaten what they brought ashore and I can't figure out what they expected to do for more. Maybe they expected to get ours.

"In my opinion it boils down to this. The Japs are excellent individual soldiers but their headwork is very poor. They have gotten away with murder so many times maybe they think that it only takes a small force to lick a big one. Well, they got badly fooled once anyway."

10. LESSONS IN ATTACK

Certain cardinal tactical principles cannot be violated in battle with impunity. We may take, for example, the case which unfortunately occurred when a Soviet unit was ordered to capture a village and hill for the purpose of assisting the neighboring units to surround and destroy enemy troops in the vicinity. The particular village was considered important as the key to avenues of supply and evacuation. For this reason, the enemy established strong defensive fortifications there.

The first and most important mistake made by the Soviet commander was the failure to make a sufficiently detailed reconnaissance. Although the terrain was not familiar to him, he relied on information supplied by friendly troops in

embrasures. Meanwhile, the artillery and mortars kept up neutralizing fire on the rear firing points.

"Attacking in formation of two battalions in line, one in reserve, our leading company was able to capture the enemy positions near the church. It was then possible for the remainder of the two attacking battalions, with supporting artillery and machine-gun fire, to develop their attack to the north and to the southwest. By committing his reserve battalion at the proper time, the Red Army commander succeeded in occupying all three villages by noon.

"Several important conclusions may be drawn from the above tactical operation. First of all, it is necessary to utilize every means of reconnaissance to discover as nearly as possible the exact positions of the enemy's forward firing points and his main line of resistance. A plan for coordinated infantry-artillery action must then be drawn up. In this plan it is essential to designate which unit will dispose of each individual firing point, and when and how it will be done. Reserve units must be designated to deal with new firing points as they are discovered.

"Fire and movement are still the cardinal principles of infantry, down to the last rifleman. They must eliminate enemy riflemen, machine-gun nests, etc. as they move forward across the battlefield. They must use every means to discover and destroy the enemy before he can employ direct fire.

"The artillery is not the only arm which can neutralize a firing point. Infantry with light mortar, machine-gun, and automatic rifle fire can also be used to this end, especially in cases where the enemy's cover is light or non-existent. It is necessary to have good observation of the field of fire for our infantry and to deny the same to the enemy. If these precepts are followed, fire superiority and the success of the attack will be assured."

Comment: The above report was received in the form of a translation of an article written by a Colonel in the Soviet Army.

11. BREAKTHROUGH AGAINST GERMAN DEFENSES

The German defensive system employed on one sector of the Eastern Front and the methods employed by Soviet infantry and artillery units in breaking through these defenses are described in the following article written by a Red Army officer:

"In many battles on the Leningrad front, it has been ascertained that the German system of defense is usually based on the establishment of a series of separate firing points which mutually support each other. In one small operation, the distinguishing characteristics of their defenses were irregularity of pattern, and the width of front covered in establishing these firing points. They were placed along two general lines. Some had embrasures and overhead cover while others were open. At distances from 50 to 200 yards in the rear were dugouts used for rest purposes, or for protection from artillery and machine-gun fire.

"In the forward firing points were the German light and heavy machine guns. Some of these were protected by a single row of barbed wire. In the rear firing points were mortars and light artillery. All firing points were assigned regular and supplementary sectors of fire. The sectors were overlapping and, in the case of machine guns, final protective lines were interlocking. Initial fire adjustment was made on the east bank of the river, the Soviet jump-off line. Mortar fire was used en masse and was shifted from target to target. In their retreat the Germans had burned all villages on the east bank of the river, thus materially improving their observation and field of fire.

"After careful study of the terrain and the enemy defenses, the Red Army regimental commander decided to strike at the enemy center of resistance near the church. After it had been reduced, it would then be possible to make a flank attack to the north, or to strike at the village held by the 6th Company of the German infantry. The local defenses of the latter comprised only four completed firing points, which were occupied by two light and two heavy machine guns. Two of the emplacements were of the open type, and communication between them and to the rear was difficult because of the heavy brush.

"On the morning of the attack, the Red Army infantry was deployed along the east bank of the river. After the artillery preparation, during which the Germans followed their customary practice of taking cover in their dugouts on the rear slopes, the infantry jumped off at dawn. As the artillery fire was lifted to the rear firing points and enemy reserve concentrations, our mortars and machine guns placed direct fire on the forward firing points. The result was that the Germans were so pinned down that they were unable to get back to their firing positions. Our small-arms weapons which were brought forward proceeded to destroy the effectiveness of the forward firing points by direct fire at the

that area. Thus he did not know at first hand the enemy system of defense or the grouping of its units.

This mistake resulted in others. The commander had received orders to move into this region 4 days prior to that set for his attack. He was given preliminary instructions then, and the attack order on the following day. His men should have been fully ready for the attack, but were not, because the commander hesitated to make a decision. He finally made his decision and issued his attack order on the day preceding the attack. The various sections were assigned various objectives, and the artillery given widely-spread targets.

Only a few hours prior to the jump-off time, the commander, who was still in doubt due to lack of reconnaissance, issued a countermanding order. There was insufficient time to reorganize the infantry units or to obtain proper cooperation between them and the tanks and the artillery. Furthermore, the new decision did not guarantee fulfillment of the task set. Instead of making a concentrated attack, the commander decided to use small portions of his forces in several diverging attacks. Battle experience has decisively proved that frontal attacks, especially over a wide front, are made only in the most exceptional cases. Here it would have been better to have made the main attack on the right flank, thus holding the main force together and providing distribution in depth.

After an artillery preparation the Soviet infantry moved into the attack. The tanks with "desyanti" troops (infantry on tanks) moved out 30 minutes ahead. Since they were not supported by the main body of the infantry, they were easily driven away from the village by the enemy. Then the well-coordinated fire of the German infantry cut off the opposing infantry which followed.

It is thus clear that the artillery preparation had not been effective. The reasons were: they received the final order too late to conduct thorough reconnaissance and organize advance OP's properly; they did not have complete firing data; and their fire could not be properly observed. The commander did not utilize radio to reestablish lost control.

Instead of bettering his situation when he committed his reserves, he made it worse. The commander brought them into the attack prematurely and in piecemeal formation. After getting tangled up in the forest, they had to retreat to their jump-off position in the face of strong enemy fire and subsequent counterattack.

The general reasons for the failure of this attack can be attributed to:

(a) Inadequate reconnaissance;
(b) Sluggishness in making the decision and issuing the attack order;
(c) Incorrect attack order;
(d) Loss of control.

12. MARK III TANK - THREE BASIC DESIGNS

Close examination of a considerable number of photographs of Mark III tanks, together with those available for examination in the Western Desert, indicates that the Mark III fighting-type tank is found in three basic designs.

Of these, the first has an armor basis of 30 mm (1.18 in) all around. The front sprocket has eight spokes, and the rear idler, though having eight spokes, is almost solid. This type is known originally to have been produced mounting a 37-mm gun and either one or two machine guns coaxially in the turret, with one machine gun firing forward in the hull. Later, however, the 50-mm was substituted for the original principal armament, and this mounting has only one machine gun mounted coaxially in the turret, the hull machine gun being retained. Of the actual specimens examined, all mounted the 50-mm gun (many are now mounting the long-barrelled type), and in these there has invariably been a Variorex gear-box, the steering being hydraulically operated. This basic type, irrespective of armament, has not been found to carry any additional armor, improvised or otherwise.

The second type has an armor basis of 30 mm all around with additional 30-mm plates bolted on. This type has a six-spoke front sprocket, and the rear idler, although having eight spokes, is more open than the first type. An ordinary six-speed gear box and hydraulically operated steering gear are fitted. Neither photographs nor specimens of this type have shown any principal armament other than the 50-mm gun with one coaxial machine gun. Moreover, every individual tank of this type has had similar additional 30-mm plates on the front and rear, this additional armor not having been found on any other type of Mark III fighting tank. The inference is, therefore, that this additional armor is actually part of the design of the tank and probably incorporated during manufacture. There have been no indications that this type originally mounted a 37-mm gun, although this remains a possibility.

The third type has 50-mm armor on the front and rear, with 30-mm armor on the sides. No additional armor has been found on any tanks of this type, and the armament has always been found to be the 50-mm gun with a coaxial machine gun and one machine gun in the hull. The front sprocket and rear idler are similar to those in the second type, and an ordinary six-speed gear box is fitted, the steering being operated by mechanical linkage. The driver's and hull gunner's entrance doors have been changed from the former double doors to single doors hinged at the forward edge. In place of the normal mantlet protecting the hull machine gun, a more hemispherical mantlet is fitted.

The following minor differences of design between these three basic types have also been noted. Originally on the first type the armor protecting the driver's visor consisted of two plates, one being raised, and the other lowered, to give protection. The third type, and probably the second type as well, have had a single-hinged piece of armor which can be lowered to give protection. The third type has also had a slightly different design of the two shields protecting the exhausts from the steering tracks. In the first and second types the air filters were located between the rear bulkhead of the fighting compartment and

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the engine, air being drawn from the fighting compartment. These filters were believed to be an oil-soaked gauze type. On the third type this arrangement was superseded by four oil bath filters, installed over the top of the engine blocks.

The suspension on all these types has been the same, the familiar six small bogie wheels with three return rollers, a front sprocket, and a rear idler. Two early types, however, are known to have had respectively five large bogie wheels and eight small bogie wheels. Both these types mounted a 37-mm gun. Nothing has been heard of either type over a considerable period, and it is probable that they were prototypes only and not produced in significant numbers.

It is known that Mark III fighting tanks have been produced in at least five models designated 'E', 'F', 'G', 'H', and 'J'. These models have consecutive chassis number blocks, and it is logical to assume that they are successive developments. There should therefore be a link with the development shown above, but so far it is not possible definitely to say what each model designation represents. It is, however, known that the first type described above has included Model 'G' tanks, and the third type has included Model 'J' tanks. All three types are known to have been in existence early in 1941, the third type probably being at that time a very new production.

It should be specially noted that, in describing German armor thickness, round numbers are almost invariably given. Careful measurement, has shown that these figures are frequently incorrect. 30-mm, for example, should almost invariably be up to 32-mm.

13. JAPANESE PRISONERS OF WAR

In the last issue of Tactical and Technical Trends an article appeared on the methods of dealing with German prisoners of war as reported in a personal letter written by a British Intelligence Officer in the North African desert. Some interesting observations on this question concerning Japanese PW are brought out in the report which follows.

* * *

Though it is true that the experiences gained from interrogating Japanese PW have not been as numerous as in the case of the Germans or Italians, nevertheless, it has been possible to indicate a pattern of behavior. However, no hard and fast rules can be made, since the problems of interrogation are as varied as human nature itself, and each case has to be treated on its merits. National and personal idiosyncrasies must be taken into account, and it is almost literally true that one PW's food is another's poison.

Such a contingency as capture by the enemy is not recognized by the Japanese military authorities. It is carefully inculcated into the Japanese soldier that to allow himself to be captured is a disgrace worse than death. Indeed, to some extent, he even welcomes the chance to die for his country. "Meet you at Yasukuni" is a popular parting expression used by a Japanese soldier to a comrade when leaving for the front. Yasukuni is a shrine in Tokyo where the ashes of "fallen heroes" are enshrined and paid homage to by millions every year.

The Japanese is therefore a difficult fish to catch. He will resist to the last, and under the circumstances one can hardly be blamed for helping him to achieve his ambition. Moreover, unauthenticated reports from Malaya mentioned cases of Japanese pilots who made successful forced landings, but blew out their brains before they could be disarmed.

According to the account of one Japanese PW, the Japanese troops who had been captured in Russia during the Nomonhan incident in 1939, and afterwards returned to Japan, were given a knife with which to commit "hara-kiri." Names of "missing" Japanese soldiers are officially reported as "killed," and their names removed from the family registers. Indeed, urns containing cremated ashes may be sent to their next of kin as proof that the "missing" are no longer alive.

Schooled in the code of honor which requires suicide rather than capture, the Japanese cannot easily be taken prisoner. Even after capture under circumstances entirely beyond his control, (e.g. a pilot who has crashed, and regained consciousness only in hospital), the well-trained Japanese officer may still demand a pistol to shoot himself, though this attitude then smacks somewhat of a theatrical flourish to save face. But once beyond the reach of help and the immediate opportunity of self-destruction, a complete mental reconstruction is not uncommon.

The following incident shows the typical attitude of the PW as soon as the self-destruction phase passes.

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One Japanese interrogated in Melbourne said he had no desire to return to Japan. He believed that his former friends would have nothing to do with him because he had been taken alive by the enemy and that he would be unable to get back into the army. He preferred to stay in Australia.

Coupled with the comparative leniency of his captors, this conviction induces in the prisoner a pliancy unusual in PW's from other nations, say, Nazi Germany. The self-justification is: "Officially, I am dead; legally, I am stateless; why not talk if I can thereby mitigate or improve my position with my captors."

In other words, his security has been more a matter of external training than of inner conviction. In an entirely new environment the traditional supports of his loyalty fall away and leave him ready to answer most questions, though he does occasionally salve his conscience by showing unwillingness to reveal matters which, in his own words, he describes as "firing a bullet at the heart of the Emperor." The names of his superior officers are revealed with reluctance.

The above remarks apply particularly to Japanese officers, who have been given some instruction on security. So far as the rank and file are concerned, they do not seem to realize that by talking they may be betraying their comrades. This serves to emphasize the necessity of segregating officers from other troops, as soon after capture as possible. Segregation should be arranged immediately and prisoners sent back to the next higher echelon under separate guard.

Aside from officers, information has been forthcoming from straightforward interrogation. Although the Japanese soldier may prefer death to capture, yet, when captured, he has been a valuable source of information.

This should be pointed out to all troops, and the importance of preserving and sending back documents captured with the prisoner should also be stressed. The Intelligence Officer's task is greatly facilitated if he has been able to examine relevant documents before he does his interrogation. As regards the treatment of prisoners when captured, it is very understandable that troops in the heat of battle cannot be expected to be overgentle, but if it is explained to them that prisoners are more amenable when treated well, they will be prepared to cooperate. They should be made to realize that from the <u>intelligence</u> point of view one live Japanese is worth more than fifty dead ones.

One PW disclosed that he had been told of the capture of a British pilot who, though subjected to an intense interrogation, had refused to talk at all. When asked as to what measures the Japanese would be likely to take with a prisoner of this description, he said he was certain that no attempt would be made to extract information by third-degree methods, as the Japanese nature was such as to admire reticence on the part of a soldier. (Comment: It is evident that this particular PW was indulging in some artful practices in order to secure better treatment for himself).

14. GERMAN PARACHUTE CARTRIDGE FOR WIND MEASUREMENT

A captured document from the Middle East gives some information on these cartridges, which are fired from a standard Very pistol, either held in the hand or placed on a stand. The size and weight of the cartridges are as follows:

length - 135 mm (5.3 in)

weight - 96 gm (3.3 oz)

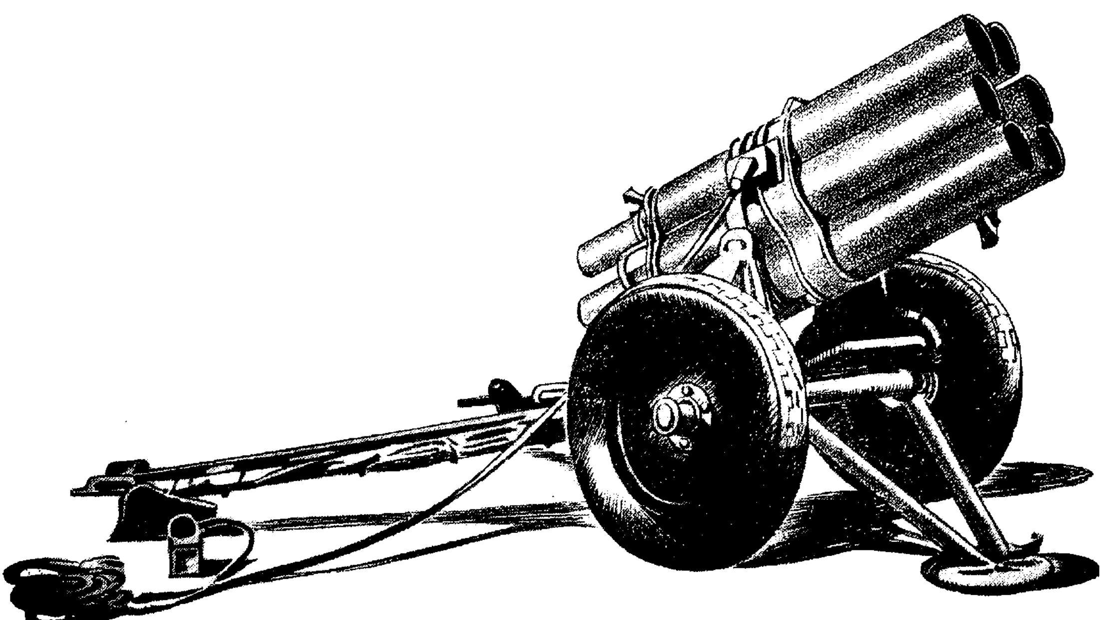
The cartridge may be easily recognized by the closing disk, painted white, with the inscription Fallschirmpatrone für Windmessung on the side.

At the highest point of flight, about 70 meters, a red parachute to which is attached a silk ribbon 1 meter long and 4 centimeters wide is released. This ribbon is held taut by a small iron weight.

Comment: This parachute would give wind data accurate enough for use by field artillery. Although no details are available as to the scale of issue of this equipment, it would be of value to units other than artillery.

15. NEW GERMAN ROCKET WEAPON

The existence of a new German rocket weapon, the Nebelwerfer 41, has been recently reported. As is shown in the accompanying sketch, the weapon has six barrels. Each barrel has a caliber of 150 mm and a range of 6,600 yards.



The barrels are not rifled but have within them three straight guide rails, about one-third of an inch deep. The projectiles rotate in flight, however, apparently due to the set of the venturis. The barrels have no breech and are open at both ends. Each barrel, however, contains a spring-operated latch, presumably to retain the projectiles in position after they have been loaded.

Firing is electrical. The separate barrels fire at intervals of 1 second, and thus the complete series of six rounds can be fired over a period of 5 seconds. This complete series can be repeated every 90 seconds.

This rocket weapon can be used for firing either HE or gas projectiles, and also probably smoke shells.

16. GERMAN TANK MAINTENANCE AND RECOVERY

Some of the maintenance units attached to German tank regiments were discussed briefly in Tactical and Technical Trends, No. 4, p. 10. More information is now available on these units and is presented here in a summary which involves some revision of the earlier material.

a. Organization

In the German armored divisions, the maintenance and recovery units are ordinarily organized as follows:

(1) Company Repair Section

Each tank company has a repair section consisting of:

1 NCO (tank mechanic), section leader,
3 NCO's, tank mechanics,
13 privates, tank mechanics,
2 privates, tank radio electricians,
1 private, armorer's assistant,
4 privates, chauffeurs.
Total: 4 NCO's and 20 EM.

This repair section has the following vehicles:

1 small repair car (Kfz. 2/40),
1 medium crosscountry repair truck, for spare parts and tools,
2 half-track vehicles (Sd. Kfz. 10) for personnel, capable of towing 1 ton,
3 motorcycles with sidecars.

(2) Battalion and Regimental Repair Sections

The headquarters of each tank battalion and each tank regiment has a repair section consisting of:

1 NCO (tank mechanic), section leader,
3 privates, tank mechanics (for a tank regimental headquarters),
or
5 privates, tank mechanics (for a tank battalion headquarters),
1 private, motorcyclist, tank radio electrician,
1 private, chauffeur, tank radio electrician,
1 chauffeur.

Total: for Hq, tank regiment, 1 NCO and 6 men;
for Hq, tank battalion, 1 NCO and 8 men.

This repair section has the following vehicles:
1 small repair car (Kfz. 2/40),
1 medium crosscountry repair truck, for spare parts and tools,
1 motorcycle with sidecar.

(3) Workshop Company

A captured German document gives the following detailed organization of a Panzer workshop company, as of September 15, 1941. It is believed that the organization given in this document is not that of tank units in a particular theater but has general application.

The document sets forth the organization of a workshop company in a Panzer regiment with six companies (as in Libya), but makes provision for added strength (as noted below) in regiments of eight companies, and in regiments of three battalions.

(a) Headquarters Platoon

1 crosscountry truck (Kfz. 1) -- 1 chauffeur, 1 company commander (engineer), 1 officer for special duties (engineer), 1 clerk (draftsman). (One of the two officers may be other than an engineer officer.)
1 motorcycle -- 1 motorcyclist (orderly).
1 medium truck -- 1 chauffeur, 2 men for salvaging spare parts (M)*.
1 light personnel car -- 1 chauffeur, 1 official (K -motor transport), 1 NCO for spare parts, 1 clerk (asst. chauffeur).

1 motorcycle with sidecar--1 motorcyclist (orderly), 1 foreman for motor transport equipment (Maybach Specialist).

(b) 1st and 2d Platoons

1 motor bus (Kraftomnibus)

* Here, and later, where the meaning of technical abbreviations is not certain, they are given as they appear in the document.

1 chauffeur, 4 NCO's for workshop service (Vorh.W.-craftsmen?) 1 tank electrician and mechanic, 1 tank electric welder, 1 saddler, 1 tinsmith, 1 carpenter, 1 painter, 7 tank motor mechanics, 3 tank transmission mechanics, 1 automobile mechanic, 1 clerk.

5 medium trucks, for spare parts and assemblies
(each) 1 chauffeur, 1 tank transmission mechanic (asst. chauffeur), 1 automobile mechanic.

1 medium truck for spare parts and assemblies
1 chauffeur, 1 NCO in charge of spare parts,
1 depot chief (M).

1 truck with special workshop and trailer for arc-welding apparatus

1 chauffeur, 1 NCO for workshop service (vorhandwk), 1 tank electric welder (asst. chauffeur).

1 heavy truck, tools and equipment
1 chauffeur, 1 tank motor mechanic, 1 blacksmith.

1 workshop truck (Kfz.19), with trailer for heavy machine apparatus, Set A
1 chauffeur, 1 foreman (leader), 1 turner.

(c) 3d Platoon (Recovery Platoon)

1 light crosscountry automobile (Kfz.1)
1 chauffeur, 1 officer (platoon leader), NCO (Panzer-Wart, tank mechanic)

1 medium crosscountry truck (Kfz.100) for towing apparatus, with rotating crane (3 tons)*
1 chauffeur, 1 asst. chauffeur (automobile mechanic).

1 medium half-track prime mover (8 tons)
1 chauffeur, 1 assistant chauffeur (automobile mechanic).

2 medium half-track prime movers (8 tons) with underslung trailers (10 tons)
(each) 1 chauffeur, 1 asst. chauffeur (mechanic), and (for one only of these trucks) 1 NCO (tank mechanic).

* A note on the document states that this apparatus will be delivered later.

2 vehicles (with apparatus)* (6 tons, Sd. Kfz. 41)
(each) 1 chauffeur, 1 assistant chauffeur (automobile mechanic).

5 heavy half-track prime movers (18 tons), with underslung trailers (20 tons)
(each) 1 chauffeur, 1 assistant chauffeur (automobile mechanic), 1 steerer for trailer; one prime mover has, in addition, an NCO (tank mechanic).

2 motorcycles with sidecars
(each) 1 chauffeur (tank mechanic), 1 NCO (tank mechanic). (One of the NCO's is second in command.)

(d) Armory Section

1 medium crosscountry automobile (Kfz. 15 m.G.)
1 chauffeur, 2 armorers (one is section leader), 1 armorer's helper.

1 motorcycle with sidecar
1 NCO armorer (O), 1 helper.

3 vehicles (not described), for armorer's tools
One with 1 chauffeur, 1 NCO, armorer (O), 1 tank electrician and mechanic (asst. chauffeur);
One with 1 chauffeur, 1 tank electrician (asst. chauffeur), 1 armorer's helper;
One with 1 chauffeur, 2 armorer's helpers (one is asst. chauffeur).

1 light crosscountry car for supply of tools
1 chauffeur, 1 armorer's helper.

(e) Workshops for Communications Equipment

1 battery-charging truck (Kfz. 42)**
1 chauffeur, 1 NCO mechanic (leader), 1 mechanic.

* The designation of this apparatus and the vehicle model number are not clear on the original document. The apparatus is designated as not yet available. The vehicles are apparently heavy half-track prime movers.

** According to the document, there is a trailer attached to this truck, but no description is given.

1 communications workshop truck* (Kfz. 42)
1 chauffeur, 1 mechanic (asst. chauffeur).

1 light crosscountry truck
1 chauffeur, 1 mechanic (asst. chauffeur).

(f) Company Supply

1 medium truck for rations and baggage
1 chauffeur, 1 NCO in charge of equipment (leader).

1 motorcycle with sidecar
1 supply sergeant (K). 1 clerk (asst. motorcyclist).

1 antiaircraft truck (Kfz. 4)
1 chauffeur, 1 NCO (in charge), 1 machine-gunner.

2 medium trucks for fuel -
One, with 1 chauffeur and 1 tailor (asst. chauffeur);
One, with 1 chauffeur and 1 shoemaker (asst. chauffeur).

2 medium trucks for large field-kitchen stoves
One, with 1 chauffeur, 1 NCO in charge of rations (asst. chauffeur), 1 cook, 1 asst. cook;
One, with 1 chauffeur, 1 NCO (accountant), 1 NCO (cook), 1 asst. cook (asst. chauffeur).

1 light automobile
1 chauffeur (clerk), 1 master sergeant, 1 medical officer.

(g) Total Strength of Workshop Company

3 officers, 5 officials,** 29 NCO's, 158 EM (total, 195 men) and 1 shop foreman for motor transport equipment (group leader).

(h) The document makes the following provisions for enlargement of the workshop company:

(1) For tank regiments with three battalions, add one workshop platoon (same organization as 1st Platoon above). Add to the Recovery Platoon two heavy half-track prime

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* An ambiguous note suggests that this equipment had not yet been delivered.

** Only one official is designated as such in the preceding breakdown of the company's organization. If the foreman and depot chief in each of the 1st and 2d Platoons are officials, this would clear up the discrepancy.

movers (18 tons) with 22-ton trailers, each to have 1 chauffeur, 1 asst. chauffeur (automobile mechanic), 1 trailer steerer. This involves additional personnel of 1 official, 6 NCO's, 49 EM - total, 56 men. The workshop company then has a total strength of 251 men.

(2) For tank regiments with 4 companies in a battalion (i.e., two battalions to the regiment), add:

To each of the 1st and 2d Platoons -
2 medium trucks for spare parts, each with 1 chauffeur and 1 motor mechanic (asst. chauffeur).

To the Recovery Platoon -
1 half-track prime mover (18 tons) with trailer (22 tons), and personnel of 1 chauffeur, 1 asst. chauffeur (automobile mechanic), and 1 trailer steerer.

(4) <u>Light Workshop Platoon</u>

According to pre-war organization, a tank regiment of three battalions had (in addition to the workshop company) a regimental workshop platoon. This unit comprised 1 officer, 2 officials, 3 NCO's, and 48 EM; the vehicles consisted of 1 automobile, 13 trucks (5 to 7 with trailers), and 3 motorcycles with sidecars.

There has been little available information on the workshop platoon since 1940. It is believed that the unit has been enlarged.

A captured document from Africa (1941) gives detailed instructions for organizing a workshop platoon in a two-battalion tank regiment of the Afrika Korps (which normally would not have this unit). In this case, an example of the flexibility of German organization, the personnel assigned to the platoon was obtained by breaking up the battalion headquarters repair sections of the two battalions. This workshop platoon was smaller than normal and was to operate, in place of the battalion headquarters repair sections, under command of the regiment.

The platoon was composed of:

1 sergeant mechanic (platoon leader),
1 Maybach specialist (for engines and Variorex gears),
2 NCO's tank mechanics (one an engine mechanic and electrician, the other to be also a welder),
2 tank mechanics,
1 car chauffeur,
2 motorcyclists (mechanics),
3 truck chauffeurs.

The platoon had the following equipment in vehicles:

1 light crosscountry automobile (for platoon leader and Maybach Specialist),
2 motorcycles with side cars (for the two NCO's),
1 truck with repair equipment (for 1 mechanic, 1 tank fitter),
2 trucks with materials and spare parts (each for 1 mechanic, 1 tank fitter),
1 light two-wheeled trailer,
1 trailer with reserve of oxygen and acetylene containers.

(5) According to pre-war organization, each armored division had, as part of divisional services, 3 divisional workshop companies. These companies would, on occasion, presumably aid the workshop units of the tank regiments, but information on this function is not available.

b. Functions of Tank Repair and Workshop Units

(1) The repair sections (the available information apparently applies to both types of repair section mentioned above) are responsible for the general maintenance of the tanks, and of their armament and radio apparatus.

In camp and rest areas, they keep a check upon the serviceability of vehicles in the unit to which they are attached; during this period, mechanics are given advanced training through attachment to the workshop company or under master-mechanics transferred to the unit.

On the march, repair sections travel with the tank units and deal with any breakdowns in vehicles or equipment, in so far as these repairs can be effected in less than 4 hours and with field equipment. If a tank breaks down, the repair section leader inspects it and determines the nature of the damage. If the damage warrants it, the tank is handed over to the recovery platoon to be towed away; otherwise, a motorcycle with mechanics stays with the tank to effect repairs, while the other elements of the repair section go on with the column. In this way, one vehicle after another of the repair section stays behind; ordinarily the motorcycles, but, if damage is serious, a half-tracked vehicle. The repair automobile always goes on with the column, while the repair truck always stays with the repair vehicle left farthest to the rear.

In the assembly area, the repair sections thoroughly test all tanks and equipment as to fitness for battle. Any breakdowns are reported at once to the unit motor-transport sergeant.

In battle, the company repair sections are under the order of the battalion commander and are directed by a battalion motor-transport officer. As a rule they follow closely behind the fighting units and range over the battle area looking for broken-down tanks. If the tank cannot be repaired on the spot it is made towable and its position reported to the recovery platoon (of the workshop company).

In one tank battalion in Libya, an armor-repair section was added to the normal repair sections. The personnel was made up of armorer mechanics detached from other repair units, and included an armorer sergeant, an armorer corporal, and seven armorer's assistants. The equipment included an automobile, a motorcycle, and two trucks. This section was to follow the tanks in battle and to work with repair sections on weapons and turrets.

Repair sections are not allowed to undertake the welding of armor gashes longer than 4 inches. In battle, the regimental headquarters repair section is attached to a battalion.

(2) The armored workshop company operates as far as 15 to 20 miles behind the fighting tanks of its regiment, except that the recovery platoon works in the battle area, mainly to tow out disabled tanks.

The workshop company handles heavier repair jobs, up to those requiring 12 hours. Repair jobs requiring up to 24 hours are sent back to rear repair bases.

The workshop company has its own power tools, a crane, and apparatus for electric welding and vulcanizing. Its platoons may be separated, and may operate independently. According to one captured document, a workshop company dealt with 18 tanks in 17 days, under conditions where there was no shortage of spare parts.

(3) The light workshop platoon in the Afrika Korps tank regiment (discussed earlier) replaced the battalion headquarters repair sections and operated under command of the regiment as a connecting link between the workshop company and the company repair sections. Like the latter, it would handle work requiring less than 4 hours. In attack, this platoon would follow along the central axis of advance, in close touch with the recovery platoon of the workshop company.

The platoon was to carry out work as follows: on brakes, gears, and clutches of Mark II (light) tanks; on damaged gear-mechanism of Mark III tanks; and on valve defects of all types of truck and tank engines except Mark III and IV tanks. They were to remove electrical and fuel-system faults; salvage and tow wheeled vehicles; make repairs on wheeled vehicles; perform autogene welding and soldering work; and charge and test batteries and electrical apparatus.

c. Tank Recovery Methods

All observers stress the efficiency of the German recovery and maintenance units. The following points have been noted:

(1) The Germans will use combat tanks to tow disabled tanks in case of retirement; even during a battle, instances are reported, both from France and Africa, where combat tanks were employed both to protect towing operations and to assist in the towing. The recovery platoon, with its trailers,

is not given the whole burden of this main job of salvage.

(2) The same principle of cooperation prevails on repair jobs in the field. Tanks carry many tools, spare parts, and equipment for repair work, and observers believe that the tank crews are trained to assist the repair crews as well as to service and maintain their own vehicles.

(3) Not only is the recovery of German vehicles very efficient, but units will often send out detachments to recover those of the enemy. For instance, a tank battalion may send out a detachment consisting of an officer, one or two NCO's, and six or eight men, transported in one or two crosscountry vehicles and protected by one or two light tanks, to search for and recover disabled hostile vehicles.

17. STANDARD JAPANESE WEAPONS

The following list gives the more important characteristics of the standard Japanese weapons now in use. The details given may contain slight inaccuracies, since a few figures are estimated, and many others have varied in different tests. The muzzle velocity of an old gun, for example, may be considerably lower than that of a new one. Ranges, also, may contain some errors, for they have been taken from tables which reported figures sometimes as "range," at other times as "effective range," and at others as "maximum effective range," or merely "effective range." Usually there has been no indication of which of several possible propelling charges has been used.

Minor modifications make no change in the model designation, but a major improvement, even though the weapon remains basically the same, will give the equipment a corresponding new model number. The model numbers are based on the Japanese calendar.

More complete details on the individual guns have been published in previous issues of Tactical and Technical Trends, and these articles will be continued in the future. A large amount of enemy materiel is now being examined at Aberdeen Proving Grounds, and the tests conducted there should provide the most complete reports yet available on all types of enemy armament.

The next issue of Tactical and Technical Trends will contain similar data on Italian weapons.

Name	Caliber (inches)	Muzzle Velocity (foot-seconds)	Max Range (yards)	Weight of Projectile	Rate of Fire (RPM) Theoretical	Rate of Fire (RPM) Practical	Remarks
6.5-mm rifle Model 38 (1905)	.256	2,510	2,600	.304 ozs	—	—	Weight, 8 lbs 11 ozs; 4 ft 2 in long without bayonet; Mauser design; 5-round magazine. There is another model, shorter and lighter, otherwise almost identical.
6.5-mm carbine Model 44, Arisaka (1911)	.256	2,500	2,200	.304 ozs	—	—	4 ft 3 1/2 in long with bayonet, weighs 8 lbs 6 1/2 ozs; 5-round magazine.
6.5-mm LMG Model 11, (1922) (Nambu)	.256	2,375	4,400	.304 ozs	500	150	Air-cooled; 30-round hopper; superseded by Model 96, but not obsolete; weight, 22 lbs 8 ozs; bipod and tripod.
6.5-mm LMG Model 96, (1936)	.256	2,400	—	.304 ozs	550	—	Air-cooled; fired from bipod or hip; Hotchkiss design; 30-round magazine; weight, 19 lbs 2 ozs.
6.5-mm Hv MG Model 3, (1914)	.256	2,437	4,374	.304 ozs	500	200	Weight, 119 lbs; air-cooled; Hotchkiss design; tripod mount; fed by 30-round strips; tripod mount.
7.7-mm Hv MG, (1932)	.303	2,700	4,587	Ball, .467 ozs	450	200 to 250	Standard Hv MG; air-cooled; weight, 122 lbs; fed by 30-round strip; tripod mount.
8-mm pistol, semi-automatic, Model 14	.315	2,100	550	.233 ozs	—	—	Weight, 1 lb 12 1/2 ozs; 8-round magazine; 4 1/2-in barrel.
9-mm revolver Model 26 (1893)	.355	1,050	330	.32 ozs	—	—	Weight, 2 lbs; 6-round cylinder.
13-mm AT rifle Arisaka (1939)	.512	—	3,280	1.55 ozs	—	—	Air-cooled; weight, 50 lbs; 25-round magazine; not yet identified in action.
13.2-mm AA MG	.520	2,722	7,085 (vert 13,120 ft)	1.82 ozs	—	—	Weight, 213 lbs; Hotchkiss design.
20-mm AA gun	.788	2,720	5,450 (vert 12,000 ft)	8.8 ozs	—	120	Weight, 836 lbs; Oerlikon design.

Name	Caliber (inches)	Muzzle Velocity (foot-seconds)	Max Range (yards)	Weight of Projectile	Rate of Fire (RPM) Theoretical	Rate of Fire (RPM) Practical	Remarks
37-mm AT gun Model 94	1.46	2,300	5,450	under 1 lb	—	—	Weight, 815 lbs; bore, 40 calibers.
50-mm grenade thrower, Model 89	1.97	—	700	Mortar bomb, 1 lb 9 ozs	—	1 man, 10 2 men, 20	Weapons supported on thigh (in kneeling position) or (usually) ground (in lying position); effective burst radius, 5 yds; weight 10 lbs 1 oz; rifled barrel.
50-mm grenade thrower, Type 10	1.97	—	—	—	—	—	Lighter, shorter, and barrel not rifled, but otherwise similar to above weapon.
70-mm battalion howitzer Model 92	2.76	650	2,800	8 lbs 5.7 ozs	—	10	Weight, 180 lbs; 4 propelling charges.
72-mm mortar	2.84	482	1,695	4.7 lbs	—		Weight, 116 lbs.
75-mm infantry howitzer Model 41 (1908)	2.96	1,250	7,675	13.85 or 14.1 lbs	—	10	Weight, 1,200 lbs.
75-mm mountain gun Model 94 (1934)	2.96	1,670	11,000		—	—	Weight, 1,200 lbs.
75-mm field gun Model 38 (1905)	2.96	1,710	11,800	13.85 or 14.1 lbs	—	—	Weight, 2,500 lbs; to be replaced by Model 90 (1930).
75-mm field gun Model 90 (1930)	2.96	2,230	15,000	13.85 or 14.3 lbs	—	—	Future service gun for division artillery.
75-mm AA gun (1922)	2.96	1,800	11,000 (vert 19,725 ft)	14.5 lbs	—	12	Length of barrel, 35 calibers.
75-mm AA gun (1928)	2.96	2,450	15,200 (vert 33,000 ft)	14.3 lbs	—	15	Length of barrel, 44.5 calibers; an improved type of the 1922 model.

Name	Caliber (inches)	Muzzle Velocity (foot seconds)	Max Range (yards)	Weight of Projectile	Rate of Fire (RPM) Theoretical	Practical	Remarks
81-mm mortar	3.19	656	1) 3,280 2) 1,312	1) 7.2 lbs 2) 14.3 lbs	—	—	1)= Light bomb, 2)= Heavy bomb; weight, 129 lbs.
90-mm mortar Type 94	—	—	612 to 4,155	11 lbs 10 ozs (chem filling)	—	—	Used mainly for firing gas shells.
105-mm howitzer Model 91 (1931)	4.14	1,790	11,500	35 lbs	—	—	Weight, 4,250 lbs; a new weapon.
105-mm field gun Model 38 (1905)	4.14	1,770	10,900	39 lbs 10 ozs	—	—	Weight, 4,950 lbs; obsolescent.
105-mm gun Model 26	4.14	2,300	17,000	35 lbs	—	—	Split trail; obsolescent.
105-mm gun Model 92 (1932)	4.14	—	20,000	33 lbs	—	—	Weight, 7,700 lbs; range 20,000 yds with "steam-lined" ammunition.
120-mm howitzer Model 38 (1905)	4.73	900	6,300	44 lbs	—	—	Obsolete.
150-mm howitzer (1915)	5.91	1,130	8,300	79.2 lbs	6 to 8	1	Weight, 4,477 lbs; standard type; later models are believed to have ranged of from 11,000 to 13,000 yards.
150-mm gun L30	5.91	2,260	19,800	80 lbs	—	—	Weight, 7,360 lbs; details unconfirmed.
150-mm gun M18	5.91	2,500	17,900	99 lbs	—	—	Weight, 15,000 lbs; other models are available.
240-mm howitzer M12	9.46	1,280	11,300	440 lbs	—	—	Fixed mount; probably coast defense.
240-mm railway gun	9.46	3,560	54,500	440 lbs	—	—	Several types of this gun.

Information on larger guns is too unreliable to warrant inclusion.

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GLOSSARY

[redacted]

CHANGES IN PLACE NAMES - NORTH CAUCASUS.

Difficulty in following operations in Russia is sometimes caused by the fact that many place names have been changed under the Soviet regime and may not be easy to identify on available maps. The list given below, for the region of the North Caucasus, shows the present place names in capitals, and the older names in capitals and lower case. For convenience, both old and new names are arranged alphabetically in the left-hand column.

Similar lists for other selected regions will be issued later.

ADIGEISKAYA	Cherkess
Alyeksandrovsk-Grushevskoi	SHAKHTI
APANASENKOVSKOYE	Mitrofanovskoye
APANASENKOVSK	Mitrofanovsk
ASLANBEKOVSKOYE	Mikhailovskaya
Azov-Black Sea area divided into	KRASNODAR TERRITORY ROSTOV PROVINCE
Batalpasninsk (Sulimov)	YEZHOV-CHERKESSK
Blagodatnoye	VOROSHILOVO
BUDYONOVSK	Prikumsk (Svyatovo Kresta)
BUINAKSK	Temir-Khan-Shura
Cherkess (Aut. Area)	ADIGEISKAYA
GALSKI (Canton)	Samurzihanski
GUMISTINSKI (Canton)	Sukhumski
IPATOVO	Vinodyelnoye
IPATOVSK (Area)	Vinodyelyensk
KARACHAYEVSKAYA (Aut. Area)	Karachayevskaya-Cherkesskaya
KAMENSK-SHAKHTINSKI	Kamensk (Kamenskaya)
KRASNI SULIN	Sulin
KRASNODAR	Yekaterinodar
KRASNODAR TERRITORY	Part of Azov-Black Sea Territory
KROPOTKIN	Romanovski-Khutor
MAKHACH-KALA	Petrovsk
Medvezhe Syelo	YEVDOKIMOVSKOYE
Mitrofanovsk	APANASENKOVSK
Mikhailovskaya	ASLANBEKOVSKOYE
Mitrofanovskoye	APANASENKOVSKOYE
ORDZHONIKIDZE	Vladikavkaz
Petrovsk	MAKHACH-KALA
Prikumsk (Svyatovo-Kresta)	BUDYONOVSK
PROLYETARSKAYA	Velikoknyazheskaya
Romanovski-Khutor	KROPOTKIN
ROSTOV PROVINCE	Part of Azov-Black Sea Territory
SALSK	Torgovaya
Samurzikanski (Canton)	GALSKI
SHAKHTI	Alyeksandrovsk-Grushevskoi

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SHAKHTINSKO-DONYETSKI (District)	Shakhtinski
Stavropol	VOROSHILOVSK
Sulimov (Batalpashinsk)	YEZHOV-CHERKESSK
Sulin	KRASNI SULIN
Svyatovo Kresta (Prikumsk)	BUDYONOVSK
Temir-Khan-Shura	BUINAKSK
Torgovaya	SALSK
Velikoknyazheskaya	PROLYETARSKAYA
Vinodyelnoye	IPATOVO
Vinodyelyensk (Area)	IPATOVSK
Vladikavkaz	ORDZHONIKIDZE
VOROSHILOVO	Blagodatnoye
VOROSHILOVSK	Stavropol
Yekaterinodar	KRASNODAR
YEVDOKIMOVSKOYE	Medvezhe Syelo
YEZHOV-CHERKESSK	Sulimov (Batalpashinsk)

SECTION II

GERMAN ANTITANK UNITS AND TACTICS

GERMAN ANTITANK UNITS AND TACTICS

EQUIPMENT

Successful offensive and defensive action against mechanized forces demands specialized equipment. The principal weapons employed by the Germans against opposing armor are guns of various calibers, mines, obstacles, and grenades. This materiel has been developed over a period of several years and has withstood the test of combat.

A list of the standard German antitank guns has been given in Tactical and Technical Trends, No. 5, p. 9.

An obstacle is any object or device capable of halting a tank or of impeding its progress. Some of the more common forms of obstacles used by the Germans are minefields, road blocks, antitank ditches, and concrete barriers. Obstacles are also constructed from damaged vehicles, trees cut and placed across an avenue of approach, explosive charges which make craters in a roadway, coils of wire disposed in depth to foul the tracks of tanks, and mines suspended from the branches of trees. Antipersonnel mines and booby traps are often used to make obstacles more difficult to remove. Obstacles and barriers are habitually covered with fire to insure their continued effectiveness.

The pole charge consists of a small explosive charge attached to the end of a fairly long pole. The most effective explosive used by the Germans for this purpose is a prepared demolition called the Pionier-Sprengbüchse. It contains slightly more than 2 pounds of explosive and can disable most tanks. Other kinds of explosives are used in makeshift pole charges with almost equal effectiveness.

The "Molotov cocktail," which proved its effectiveness during the Spanish Civil War, has been adopted and used by the German Army. It consists in essence of a quart bottle of gasoline with a gasoline-soaked rag attached to its base. The infantryman lights the rag and throws the bottle at the tank. When the bottle breaks, the tank is immediately engulfed in flame. Improved models of this bomb have been used in which the gasoline is ignited by a substance which explodes on contact with a hard surface. The bottle is sometimes filled with smoke-producing materials to blind the tank crew or with slow-burning combustible oils.

The stick or "potato-masher" grenade (M24) normally contains 1 1/4 pounds of explosive and has a 5 1/2-second time fuze. For use against tanks, the heads of five or six grenades are tied in a bunch around a seventh.

The grenade PH 39 is newer than the M24 and is said to have from six to eight times greater effect. It contains 1 5/16 pounds of explosive and has a 4 1/2 second time fuze. One of these grenades is usually sufficient to put a light or medium tank out of action if it strikes a vital spot.

ORGANIZATION

Small antitank units such as the platoon and company are organic parts of larger organizations (regiments and battalions), and their mission is to provide these organizations with defense from armored attack. Large antitank units such as battalions and GHQ forces are used as general reserves, and either allotted according to the requirements of lower units or committed at critical points during an action. Normally, the antitank units which are employed as reserve forces are given a large number of self-propelled guns to provide the mobility essential to their missions.

Flexibility, which is a characteristic of all German organization, is especially apparent in the makeup of antitank units. This is partly because antimechanized forces are employed in support of other arms and change their composition according to the task, and partly because of the shift from 37-mm to 50-mm AT guns. As units have their armament and number of guns changed, they have a corresponding change in personnel and services.

At present it is difficult to say with any exactness what type of guns any given antitank unit will have. Weapons are issued to units from the available supply, and the newer types are being allotted as rapidly as they are produced. the unit organizations given below are standard, but not necessarily the only types which the German Army will employ.

The GHQ reserve pool contains heavy antitank battalions, antitank battalions, and probably some self-propelled tank-hunter battalions.

The infantry division's antitank units include one antitank battalion; in addition, each of its three infantry regiments has an antitank company.

The armored division has one antitank battalion, in addition, in each heavy weapons company of its reconnaissance battalion, motorcycle battalion, and two motorized rifle regiments, there is an antitank platoon.

Both the mountain division and the motorized infantry division each have one antitank battalion. The latter also may have one tank-hunter battalion for each of its three motorized rifle regiments.

COMPOSITION OF ANTITANK UNITS

The antitank battalion comprises headquarters and staff; three companies, each with four 37-mm AT guns six 50-mm AT guns, six machine guns, organic transportation, and a maintenance section; and a signal section with 6 pack radios, 2 armored radios, and a lineman's section.

Arms carried in the antitank battalion are twelve 37-mm AT guns, eighteen 50-mm AT guns, 18 machine guns, 315 rifles, 204 pistols, and 13 machine pistols (submachine guns). Accompanying the guns at all times are 180 rounds of 37-mm ammunition per gun, 38 to 72 rounds of 50-mm ammunition

per gun, and 1,000 rounds of machine-gun ammunition per gun.

The heavy antitank battalion is a GHQ unit maue up of 88-mm and 50-mm guns. Its exact composition is not known, but is believed to vary widely accord ing to the number of weapons available.

The tank-hunter battalion contains two companies of 47-mm antitank guns on self-propelled mounts (Mark I tank chassis), or as a variation, one company of 47-mm AT guns and one company of 37-mm AT guns. These tank-destroyer units may also be organized as GHQ troops.

The antitank company of an infantry regiment is fully mechanized, and consists of headquarters and four platoons. Each of the platoons consists of three sections, each armed with a 37-mm AT gun, and one light machine-gun section. Some 50-mm guns have replaced the 37-mm guns which have formerly made up this company's armament.

The antitank platoon of the heavy weapons company is thought to be the= same as a platoon of an infantry antitank company.

Barrier detachments are not part of the antitank forces, but their approximate makeup is given here because of their important tactical mission of constructing antimechanized obstacles. Since barrier detachments are engineer task forces constituted for specific missions, no definite organization exists. A typical barrier detachment (Sperr Abteilung) for a corps would comprise an engineer battalion; a mechanized column (Sperr Kolone) equipped with explosives; one or more bicycle companies; one or more battalions of artillery; and a signal platoon. Such a unit organized to assist division antitank forces would include the following: The division engineer battalion (or part of it); elements of the antitank battalion; one or more bicycle companies; one or more batteries or artillery; and some infantry elements.

All of these forces are supplied with large numbers of motor vehicles, giving them the increased mobility necessary for the rapid performance of their tasks.

TRAINING

When entering the German military service all soldiers take a basic training course of 6 weeks prior to being assigned to permanent units. For the men of antitank units, this period consists of: intensive training in basic infantry subjects; recognition of enemy and friendly armored vehicles; laying and firing antitank weapons and small arms; and handling antitank vehicles and guns. Along with their technical training, they learn something of the theory of the employment of antitank forces and get a course of physical toughening.

In addition to these basic training courses, there are courses designed to make soldiers antitank specialists. A document captured from a German prisoner in Libya gives a good idea of the content of such a course. A translation of

his account follows:

"The course lasted from 8 to 10 weeks. During the mornings of the first 2 weeks, we learned the principles of gun laying and aiming, with considerable practice in aiming at the 'snake' target, which is 10 feet high and placed at a distance of 35 feet. The gun must be brought into position and correct aim taken in 60 seconds. The snake target can be given both vertical and horizontal movement.

"The afternoons were spent in manhandling the gun at double time. The 37-mm gun was drawn by two men with ropes, with two men pushing behind. Each gun had a commander. After every 20 minutes there was a 10-minute break. The whole distance to be covered was about 5 miles. The last stretch of more than 2 miles rose about 330 feet and included several hollows. This distance was crosscountry and had to be covered in an hour. On arrival at the top of the hill there was a further 10-minute break which was followed by training in judging distances to farmhouses, trees, etc. The distances were checked and corrected with a rangefinder.

"Aiming and firing with dummy cartridges were then practiced on moving targets of cars camouflaged as tanks. These cars moved at the same speed as tanks. They were at ranges of from 450 to 1,350 yards and in a field of vision 350 yards wide. During this practice the gun positions were moved as much as 100 yards.

"The return journey, mostly downhill, had to be covered in 70 minutes. For the last 10 minutes before arrival at barracks, the crews marched along, ropes over their shoulders, singing lustily. The whole exercise was carried out in full kit--steel helmet, rifle, gas mask, pack canteen, and cartridge belts filled with old iron.

"Fifteen minutes was allowed for changing into fatigue clothes; then followed a 30-minute period of instruction in gun cleaning, followed by theoretical instruction in gun parts.

"The third, fourth, and fifth weeks were spent mainly in theoretical instruction and firing practice with a detachable sub-caliber barrel liner. Ammunition fired was the same as used in the service rifle, and the range was about 10 yards. The size of the figures on the target was about 2 inches square. On the targets were four squares, each with five figures, which were fired upon in any order in accordance with the instructions of the gun leader. The time allowed for sighting, loading, and firing was 35 seconds, and the standard to be attained was four hits and one near miss. In addition, there was 45 minutes daily of double-time gun drill in which turning, stopping, crosscountry movement, and getting the weapon into firing position were practiced.

"The remainder of the course included further gun drill—laying, sighting, and loading with dummy cartridges. All of the exercises were aimed at inculcating speed. The first gun set the pace and the other three guns had to

keep up with it. Toward the end of the course there was some field firing. For snap shooting, each gunner was allowed five rounds.

"Wooden practice tanks of the same size as normal tanks were pulled along at a speed of 6 miles per hour. These practice tanks were suspended from overhead ropes, and rollers were used to make them turn corners. The five rounds were to be fired at 1,350, 1,100, 880, 660, and 440 yards, respectively. The qualifying score was 80 percent. Afterwards, there was firing practice at cardboard figures representing machine-gun nests. These figures were life-sized, and represented the personnel as either prone or kneeling. The qualifying score in this exercise was 100 percent. Five rounds were fired on this range, one at 440 yards, one at 660, and the other three at 880. Gunners who made the best records were rewarded by being allowed to fire 10 extra rounds.

"Instruction both practical and theoretical, was also given in fighting British incendiary bombs and land mines. There were occasionally exercises with rubber boats, in which the antitank guns were to be transported across rivers. At the end of the period of training there were maneuvers for 3 days."

After his preliminary work, the German antitank soldier goes into unit= training. The primary objective of unit training in the German Army is teamwork. Since soldiers come to antitank companies and battalions with a good knowledge of their weapons, the first lesson that they learn is the employment of these weapons in a closely coordinated team. Most of this instruction is by platoons, as the platoon is the antitank unit most frequently used in actual combat.

A great deal of the instruction is in the movement and emplacement of the guns, and gun crews are taught rapid and effective means of selecting and camouflaging positions. Gunnery, however, is not neglected, for there if frequent practice in laying and firing weapons. As in the basic courses, great stress is laid on the manhandling of guns, and there are frequent company and platoon exercises in which guns are put into position, moved to new positions, and fired without the use of prime movers.

Officers of antitank units are trained to exercise a great amount of initiative in the disposition of their guns and in coping with unexpected conditions. Speed in making decisions is emphasized.

TACTICAL EMPLOYMENT OF ANTIMECHANIZED UNITS

As German pre-war military philosophy worked out a theory of combat emphasizing movement, armor, and air support, one fact became apparent: the development of the armored and air arms had swung the balance of power in battle heavily in favor of the offense. More specifically, the Germans calculated that each antitank gun attacked by compact tank units could hardly destroy more than three tanks before being submerged by the advance. On this basis, they decided that to reestablish the equality between attack and defense it would be necessary to protect antitank weapons effectively by camouflage, concealment,

and armor, and to oppose tank attacks with a flexible and mobile mass of guns on self-propelled mounts, capable of strengthening defense in depth.

Another development in the theory of antimechanized tactics, the offensive attitude, has been equally important in the evolution of the present German system. With the development of a large number of mobile guns, giving antimechanized units more mobility than tanks, it was realized that guns need no longer lie in wait for the armored attack, but could seek combat with enemy armored vehicles. Every soldier was impressed with the ability of new weapons and methods to destroy tanks, and the names of units were changed from Panzerabwehr (antitank defense) to Panzerjäger (tank hunter). (It is interesting to compare this German change in attitude with a similiar change in the U.S. Army, where "antitank" battalions have been changed to "tank destroyer" battalions and the offensive character of antimechanized operations emphasized.)

A captured German training manual emphasizes the offensive role of the division antitank battalion and the GHQ antitank units, saying:

"As a result of its speed, mobility, crosscountry performance, and proection against tanks, the antitank battalion can attack enemy armored vehicles. Its object is to engage and destroy enemy tanks by surprise attacks from unexpected directions with concentrated fire. In addition to engaging enemy tanks, the antitank unit has the task of neutralizing antitank defenses, thereby supporting its own tanks."

The only real protective missions which are now assigned to antimechanized units are those of the antitank companies of infantry regiments and the antitank platoons of heavy weapons companies. Division antitank battalions and GHQ antitank units are always considered as reserve forces or as offensive elements. The organic companies are used for local protection, but are not expected to repel tank attacks in force; for this purpose the more mobile battalions are committed at the point where the main force of the armored attack strikes.

The actual proportion of self-propelled guns in the German Army at present is not known, but it is believed that the objective is for all GHQ units to be self-propelled throughout, and for division antitank battalions and regimental antitank companies to be two-thirds self-propelled. This would provide a high degree of mobility, while retaining a few easily camouflaged towed guns, which could be used well forward to protect avenues of tank attack.

In battle, emphasis is place on antitank units moving rapidly in and out of position. All of the personnel and installations of antitank units are required to be prepared for tank attack at all times. Careful and continuous reconnaissance is deemed a necessity, as each unit must be familiar with the most likely routes of tank approach and be prepared to defend these routes.

Special emphasis is laid on reports by all subordinate units on the approach of tanks. These reports, combined with the reports of reconnaissance

agencies, permit the timely and coordinated organization of defensive measures.

The antitank battalion of an armored division goes into the attack with the tanks, following them from objective to objective, and engages all tanks threatening them from the flanks and rear. Some detachments of the antitank battalion may also be allotted to the infantry following the tanks if this is necessary for security.

If infantry is attacking without tanks, the antitank battalion accompanies it in the same manner as when accompanying the tank attack, except that the main body of the battalion is kept behind the infantry flanks to repulse enemy counterattacks or overcome unexpectedly strong enemy resistance. Units of the antitank battalion are not usually attached to larger units of the attacking force, but furnish independent support.

Platoon commanders are instructed to display a great amount of initiative in engaging targets. If there are no enemy armored vehicles encountered on one platoon sector, the platoon gives necessary assistance to the guns of neighboring sectors. Camouflage of guns in successive attack positions is not required, but platoon leaders are cautioned to use the greatest care in the proper selection of positions which command important terrain.

In a pursuit, antitank units are attached to the most advanced elements, usually by platoons. They have the mission of giving protection to the flanks of the most advanced elements and of destroying armored elements in the enemy rear-guard, thus breaking the backbone of the enemy delaying action.

In a withdrawal, regimental antitank units normally defend their regimental units along the line of advance of enemy tanks. Part of the division antitank battalion may be used to strengthen this defense. In the case of an exterior division or of a division operating alone, some of the antitank battalion may be employed for the protection of flanks.

The remainder of the division antitank battalion is divided into two parts. One reconnoiters and prepares positions for the next delaying action, while the other acts as a mobile reserve for the immediate use of the division commander.

In spite of the offensive emphasis given to the antitank units of the German Army, their primary mission remains defensive. In performing this defensive mission, however, these units may use some of their offensive tactics with great success.

The terrain plays an important part in plans for the defense of a sector against mechanized attack. After thorough reconnaissance of the defensive sector assigned to a division, the plan for antitank defense is perfected. The principles of this plan are, generally, to deny the best avenues of tank approach to the enemy by covering them with liberal antitank fire, while the less likely avenues of approach are denied to the enemy by obstacles. The antitank units organic in regiments are used well to the front and are emplaced in camouflaged

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positions; the division antitank battalion on its mobile mounts is kept in the rear, ready to lend support where needed and to give depth to the defense.

Typical German procedure* for the preparation of antitank defense in a defensive situation is as follows:

(a) Assume that the division is defending a sector 9,000 yards wide, regiments abreast. The terrain is diversified, offering some tank obstacles, such as canals, thick woods, and a stream, and also offering open, rolling corridors which are excellent avenues of approach for tanks.

(b) Reconnaissance and map study are made to determine two important locations along the front: one, the engineer center of resistance (Pionier Schwerpunkt) and the other, the antitank-gun center of resistance (Panzer Abwehrgeschutz Schwerpunkt).

(c) The engineer center of resistance is located in that section of the front where natural obstacles contribute defensive strength. Engineer troops improve and expand the natural defensive features found in this section.

(d) The antitank-gun center of resistance is located in that section of the front where the ground is open and rolling, ideal terrain for tank operations. The regimental antitank company's guns are emplaced in concealed positions 200 to 400 yards in rear of the main line of resistance, while the antitank battalion is farther to the rear, with gun positions echeloned in depth. The battalion gun positions are selected, and positions leading thereto carefully reconnoitered, but they are not usually occupied until the warning of a hostile attack is received. The guns remain under cover in positions of readiness, conveniently located to permit rapid movement to any threatened area.

Antitank defense on the march follows the same general principles as in a static situation--that is, the regimental antitank companies provide defense for their units, and the division antitank battalion acts as a general reserve to be used against a concentrated tank attack.

Within the regimental march column, the antitank company is employed in units of full platoons. The four platoons are usually disposed as follows: one platoon has one gun with the point and the remaining two guns at the rear of the advance party; one platoon is placed at the head and one at the rear of the reserve; and the last platoon marches with the combat trains. If, however, the regiment is marching in the division's main body, one platoon marches at the head of the regiment, one at the rear of the foot elements, and the other two platoons with the combat trains.

The location of the division on the march is the determining factor in the disposition of the division antitank battalion. When the division has both flanks covered, the battalion marches with the combat trains; when there is an exposed

* This account is based on a problem given at the Kriegsakademie, the German equivalent of the U.S. Command and General Staff School.

flank and a strong tank attack is possible, the battalion protects the exposed flank, moving from position to position by bounds, the companies leap-frogging each other so that two companies are always in position to fire.

The division commander determines the tank-warning system prior to the start of the march, reconnaissance elements being marshalled to insure early intelligence of the approach of hostile armored elements.

OBSTACLES AND MINES

German engineers cooperate closely with antimechanized units in defense against tanks. As previously stated, engineers reinforce by obstacles and mines the terrain less favorable for tank attack, whereas the antitank guns are massed in those areas not easily defended by artificial barriers. Both obstacles and minefields are always covered by the fire of antitank weapons and small arms. As a matter of fact, the Germans often use these antimechanized obstacles to slow or halt tanks and make them good targets.

The Germans make every effort to slow or halt pursuing hostile forces by mining roads and bridges. Mines are buried under the earth or in snow, and may often be detected by the presence of small mounds.

The Germans employ antitank minefields extensively, finding them particularly valuable in the desert, where flat terrain and hard soil makes the construction of artificial obstacles quite difficult. These fields are often laid in complicated patterns. As a result their removal is difficult and hazardous, since the uncovering of a small portion of the field usually does not give the key to the remainder. The hazard of clearing these fields is increased by the liberal use of antipersonnel mines scattered among the antitank mines.

German minefields are usually very plainly marked, to warn friendly vehicles. The Germans consider safety in this respect more important than deception. In the rear areas they often string a low wire fence around the fields, or dig a shallow ditch. In some cases guards are placed at the gaps in the minefields to see friendly vehicles through safely.

Minefields are employed with great care, as the Germans appreciate that it is possible for them to be turned to the disadvantage of the unit that lays them. The object is to construct an obstacle that will block enemy vehicles without hampering the maneuver of German forces.

Antimechanized obstacles are built by special engineer task forces (Sperrabteilung) who must have great mobility. Their personnel is taught the necessity for the rapid performance of their jobs.

The cardinal principle of the location of antimechanized barriers is that they are placed in such a manner as to cause tanks and other vehicles to appear at practically point-blank range in fields of fire of the weapons covering them.

USE OF ANTIAIRCRAFT AGAINST TANKS

In the German Army it is emphasized that antiaircraft and antitank guns have the same general characteristics--high muzzle velocity, mobility, wide traverse, and rapid rate of fire--and therefore antiaircraft guns should be used to assist in defense against tank attack. This role is generally regarded as secondary, but on occasion part of the German antiaircraft weapons have been employed against armor during a simultaneous air and tank attack. In some cases antiaircraft units have been assigned to higher units with the primary mission of furnishing additional antitank protection.

INFANTRY TANK HUNTING

German training and operations have both emphasized the importance of aggressive action against tanks by dismounted infantry personnel. All tanks, they teach, have certain vulnerable points which make them easy prey for close-combat weapons specially designed for the purpose and employed by aggressive, trained soldiers. The chief weaknesses of tanks are their relatively poor visibility, their inability to defend themselves within a close radius of the vehicle (dead space), and the time lag in shifting guns from target to target. They also need certain times, usually at night or in rear areas, to carry out maintenance and repairs. This is always a favorable time for the dismounted tank hunter.

Tank hunters, acting alone or in pairs, are also taught to use smoke candles, smoke grenades, and smudges to produce films on the vision slits of the tanks. By using these methods they can get within close enough range to employ hand weapons.

A German training instruction, issued to an infantry unit shortly after it had successfully repelled a British attack, sets forth the basic technique of infantry tank hunting. A translation of the document follows:

"The construction of our defensive areas has proved extremely effective, particularly the provision of antitank trenches. No casualties were sustained when British armored fighting vehicles penetrated our position. The troops were protected by antitank trenches and could employ their weapons on the infantry following the tanks, while the tanks were being engaged by antitank weapons.

"The lesson to be drawn is that the infantryman should allow the tank to pass overhead while he is in his antitank trench. If he attempts to jump clear, he draws fire on himself from the tank, whose field of fire is extremely limited. The infantryman's main task remains the repulsing of the assaulting infantry. In addition to this, however, enemy tanks can be knocked out by courageous action with close-combat weapons.

"The most important weapons for this purpose are the Molotov cocktail and the pole charge. The most convenient charge is the prepared charge (Pionier Sprengbuchse), which contains 2.2 pounds of explosive. Its strength is

such that it can knock out a British infantry tank without unduly endangering its user by the explosion. The drag-mine is also highly successful.

"Molotov cocktails are most effective if they burst on the ribs of the engine cover. The flaming contents envelop the motor, which is usually set afire.

"The tank is particularly sensitive to the prepared charge in three places--on the tracks, the engine cover, and the horizontal armor near the turret. If a prepared charge bursts in close proximity to the tracks, the chain is damaged to such an extent that it breaks when the tank moves forward. A charge placed on the reinforcing ribs penetrates them and the engine cover, damaging the engine. The horizontal armor near the turret is weak in the English infantry tank, and the detonation of a charge there causes complete penetration and great blast effect within the tank. The drag mine can be effectively used by an infantryman in his antitank trench.

"In order to employ the close-combat weapons mentioned above, the infantryman must at least be within throwing range of the tank. He must, therefore, wait in his cover for the tank to approach. But this cover is useful only when it has been specifically constructed as an antitank ditch--that is, it must be level with the ground, well camouflaged, and not more than 40 inches wide, so that the tank can pass overhead without endangering the infantryman.

"The danger to the infantryman who finds himself close to a tank is slight. An infantryman in his antitank trench is always superior to an enemy tank that is within throwing range if he is properly equipped. The periscope of the British tanks is inadequate, allowing the driver to see straight ahead only, and the gunner can only see in the line of his gun. Because of the limited play of the weapons mountings, they cannot be depressed sufficiently to cover the immediate vicinity of the tank. An infantryman in this dead area must inevitably use his close-combat weapons effectively."

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All correspondence pertaining to the bulletin should be addressed to the Dissemination Group, M.I.S.

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Intelligence Bulletins, published monthly.
Special Series, published at least once a month, of which "The German Motorized Infantry Regiment" and "The Development of German Defensive Tactics in Cyrenaica--1941" are the most recent.
Campaign Studies, the most recent being "The German Campaign in Norway."
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SECTION I

NOTE

Because of an error in printing, the following correction should be made in Tactical and Technical Trends, No. 10 October 22, 1942.

Transpose pages 16 and 18.

1. ITALIAN CIRCLING TORPEDO

The British Navy has recently made known the recovery of an Italian circling parachute torpedo, which has a number of characteristics that distinguish it from any other torpedo of its kind.

After the torpedo had been rendered inoperative and examined, it was found to have no depth-setting device and would therefore travel on the surface of the water with a probable wake. It is 19 inches in diameter, approximately 8 feet long, and weighs about 700 pounds, the weight of the explosive charge being nearly 200 pounds. The torpedo has a maximum speed of 6 knots, and a running time of about 30 minutes. It is equipped with a three-blade propeller and a 250-volt electric motor.

Features of the torpedo that differ externally from other Italian circling torpedoes are listed below:

(a) The position of the impact fuzes.
(b) The use of a ring bolt for the carrying fitting.
(c) The location of the switch on the under side, port quarter.
(d) Propeller streamlined flush with the body of the torpedo.
(e) 19-inch instead of 18-inch diameter.

Internal differences which characterize the torpedo include the following features:

(a) 250-volt instead of 220-volt motor.
(b) Motor speed of 3,700 rpm instead of 2,880 rpm (geared down to 750 rpm).
(c) Mercury switch on the battery. (Hitherto not found.)
(d) Spring-loaded tail switch operated by a spring-loaded rod inside the after-part of the propeller shaft.
(e) Starboard helm setting. (Others are set for port helm only.)

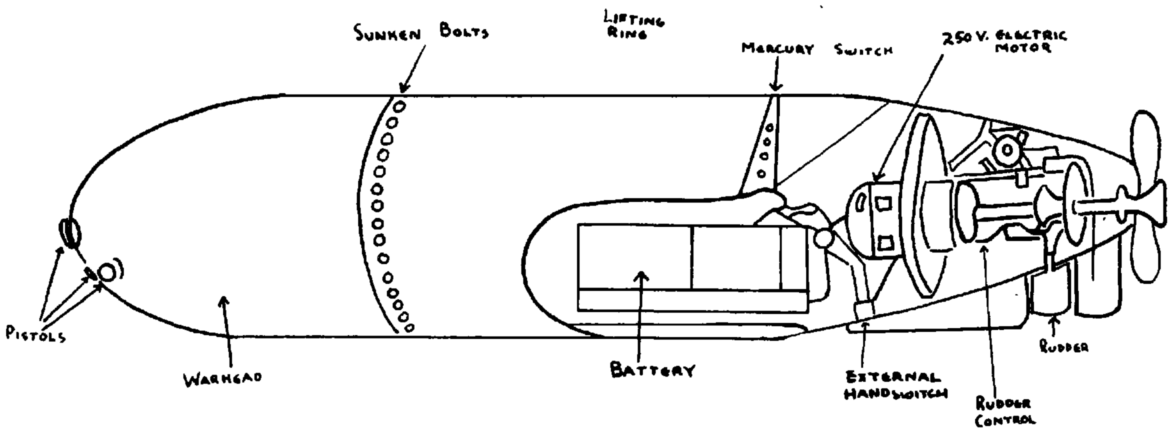
The rudder of the circling torpedo is actuated by the arm bearing on the eccentric projection of the cog-wheel, which is driven by the worm on the propeller shaft. The torpedo moves to starboard in a series of increasing circles.

Of the three fitted switches, one is an external hand switch on the port quarter and one a mercury switch on the battery, cutting out when the torpedo head lies approximately 45 degrees depression to horizontal. The third switch, which is spring-loaded, is placed inside of the after-part and is held open by a roller bearing and a disc fitted around the propeller shaft. The disc is secured by a spring-loaded rod inside the propeller shaft and projecting inside the propeller boss, where it appears to be held by a parachute lug and a plug, which is soluble. When the plug dissolves, the spring-loaded rod ejects the parachute lug, and simultaneously brings the disc further aft, permitting the spring-loaded switch to close and the motor to start.

It is believed that the torpedo had been dropped about two months prior to its recovery, as it was heavily corroded. Since the corrosion prevented the unscrewing of the impact fuze, it was decided to remove the war head complete and recover the propulsion machinery, etc. This was successfully accomplished and the war head rendered inoperative. Following the examination of the torpedo, the propulsion machinery and other parts of the mechanism were dispatched to London for further study.

It is believed that circling torpedoes have been used only experimentally up to the present time. When employed against convoys, the pilot would probably not have to maneuver his aircraft within close range of antiaircraft fire in order to score a hit, but could drop the torpedo at a reasonably safe distance and immediately resort to evasive tactics. The average running time of the torpedo, which is from 30 to 40 minutes, would give an additional advantage. A weapon of this kind would, therefore, present a serious problem to a convoy.

This type of torpedo might also be used against large vessels lying at anchor. They could best be protected against such an attack either by being surrounded with lighters made fast to the ships or by being anchored in an area enclosed by a barrage net extending to a depth of 5 feet.



250-volt electric, 3,700 rpm, geared down to 750 rpm.

One external hand switch; one mercury switch on battery, and one in tail which is operated when spring-loaded rod inside propeller shaft ejects parachute lug from propeller boss after soluble plug dissolves.

Vertical rudders driven by motor through worm gearing and eccentric cam working on rudder lever, giving gradual reduction of starboard helm. Torpedo would move in series of increasing circles to starboard.

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2. FOCKE-WULF 190 COMPARED WITH SPITFIRE IX AND P-38F

On the basis of incomplete tests of a captured Focke-Wulf 190, Germany's newest and best fighter plane, the following comparison may be made between the FW-190 on the one hand, and the Spitfire IX and the P-38F on the other.

a. FW-190 Compared with Spitfire IX

Speed--the two planes are approximately equal at most altitudes.
Climb--up to 20,000 ft the two planes are approximately equal, but at higher altitudes the Spitfire is definitely superior.
Dive--the FW-190 excels.
Maneuverability--except in radius of turn the FW-190 is superior.
General conclusion--the Spitfire compares favorably with the FW-190, especially at high altitudes.

b. FW-190 Compared with P-38F

Speed--while the P-38 is slower at low altitudes, the two planes are approximately equal at 20,000 ft, and at higher altitudes the P-38 rapidly excels.
Climb--the FW-190 is superior up to 15,000 ft, but after 20,000 ft, the P-38 has the advantage.
Dive--the FW-190 is faster in a dive than the P-38, particularly in the initial stages.
Maneuverability--except at lower speed of around 140 mph the FW-190 is superior and will out-turn the P-38.

3. EXPLODING DEVICE FOR JETTISONING BOMB CARRIERS ON JU-88

It has been ascertained that the external bomb carriers on certain Ju-88 aircraft are now being fitted with a jettison device. This device, which jettisons the complete carrier and fairing and also the bomb, if it is still in place, consists of electrically fired explosive charges which cut the holding bolts. The carriers are held to the wings by four studs, each of which is drilled to contain a charge, which shears the studs at a "neck" on the bolt, allowing the bomb rack to drop off.

It is suggested that this device is used to:

(a) Jettison unnecessary weight and reduce head resistance in the event of failure of one engine;
(b) Enable bombs and carriers to be jettisoned quickly if the aircraft is intercepted;
(c) Get rid of a bomb if it is hung up.

Reports have been received from British pilots from time to time stating that pieces have been seen to fall from enemy aircraft during an action. It is possible that these may sometimes have been bomb carriers.

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4. GERMAN FIGHTER TACTICS TO AVOID ANTIAIRCRAFT FIRE

The following report, obtained from a German prisoner of war, describes certain German aerial tactics used to lessen the effect of antiaircraft fire.

German fighter pilots have consistently used two forms of passive defense against antiaircraft fire. They either continued flying at the same speed, turning and twisting the aircraft in flight, or they throttled down the engine with a view to giving the ground defenses the feeling that the airplane was at a lower altitude than it really was, with the result that most of the fire was short.

ANTIAIRCRAFT

5. ANTIAIRCRAFT DEFENSE OF TOBRUK

The following brief comments were made at Tobruk during the period when it was undergoing intense bombardment by Axis airplanes. The antiaircraft defense of Tobruk was outstanding up to the time of its surrender.

a. Rate of Fire

The rate of fire with the 37-mm antiaircraft gun of 15 rounds per minute was consistently mantained, each round being set with the appropriate fuze setting. This rate of fire was continued for periods of well over a minute, and does not represent the maximum result of any single instance. This performance was due to the considerable practice obtained, and was substantially the same whether the loading tray was used or not.

b. Cover

The gun emplacements had often been the object of attack, and many of them were surrounded by numerous bomb craters. Close attention was therefore given to the parapets which, whenever possible, were themselves countersunk.

Stone parapets were as much as 6 to 8 feet thick at the base and about 5 feet at the top. Heavy construction such as this represented considerable labor, but after several attacks there was no question of skimping the work.

Stone parapets did not splinter and were found to be highly satisfactory against blast.

The size of the emplacements was reduced to a minimum compatible with freedom of action for the gun crew. This proved to be a diameter of 21 feet.

c. Camouflage

Close attention was paid to camouflage which, because of the broken terrain, presented very little difficulty. A number of alternate and supplemental gun sites were prepared, partly for decoy purposes and partly to enable guns to be shifted on short notice.

d. Offensive Spirit

The offensive spirit shown by the gun crews at Tobruk was particularly noticeable, and it is not too much to say that during the siege the AA defense dominated the morale of the enemy flyers. This was reflected in the relatively little damage done in the harbor despite the heavy scale of the attacks, and the amount of air effort directed against the gun positions themselves.

6. GERMAN ANTIAIRCRAFT DEFENSE

The article translated below is a chapter from General von Cochenhausen's "Tactical Handbook for the Troop Commander" (1940 Edition). This text is extensively used by German army personnel, especially officer candidates and junior officers, and is believed to embody the current German thought on the subjects treated. For previous excerpts from the handbook, see Tactical and Technical Trends, Nos. 7 and 8.

It should be borne in mind that most German antiaircraft units are a part of the Luftwaffe organization (see Tactical and Technical Trends No. 5, p. 5 and No. 7, p. 7).

a. General

The missions of ground antiaircraft defense are:

Defense against hostile aerial reconnaissance,
Defense against hostile artillery observation,
Defense against hostile air attacks on personnel and important defense installations,
Support of friendly air combat strength.

This defense is provided by light and heavy antiaircraft battalions, antiaircraft searchlight battalions, and air barrage balloon battalions.

b. Weapons

(1) Antiaircraft Guns

Light and heavy antiaircraft weapons supplement each other in their effect. In addition, troops fire their own machine guns and rifles against planes

flying within a range of 800 yards. The antiaircraft gun, however, is the backbone of the entire antiaircraft defense. The battery is the fire unit, and the sub-allotment of its elements is not considered practical.

The heavy battery bears the brunt of the antiaircraft defense in the combat zone and combines a great range with rapid fire and mobility.

The mission of these heavy antiaircraft guns is to protect the ground troops against air reconnaissance and high-altitude attacks while on the march, at rest, or in actual combat. Moved by tractor or truck, the average marching speed of these heavy AA guns is from 5 to 20 miles per hour. Horse-drawn antiaircraft cannon are employed only by units contending with fuel shortages and very unsuitable road nets. Antiaircraft units moved by tractor or truck can be prepared for action rapidly, have great mobility, and can be employed within the effective range of hostile artillery.

These weapons are employed against hostile airplanes, especially attack units, flying at altitudes up to approximately 25,000 feet. Heavy antiaircraft artillery cannot be used against planes flying at altitudes under 3,000 feet. Because of the requirements for special fire-control equipment and special ammunition, these weapons are only to be used against ground targets in the case of close-in tank attacks.

(2) <u>Light Antiaircraft Cannon</u>

These lighter weapons are especially suitable for defense against planes flying at short ranges and at low altitudes, such as those attacking by ground-strafing and dive-bombing.

They are moved by mechanical transport, either on trucks or on self-propelled mounts, and are characterized by great mobility and, using tracer, by their ability to track air targets having a high angular rate of travel and change of ranges. The average marching speed of units equipped with these weapons is from 16 to 25 miles per hour.

(3) <u>Antiaircraft Searchlight (60 and 150 cm)</u>

By means of searchlights, alone or in cooperation with pursuit aviation, it is possible to discover hostile airplanes at night and deliver aimed fire at them as well as to blind the airplane crews, thus increasing their difficulties in orientation and preventing them from dropping bombs accurately. Searchlights do not attempt to illuminate the entire sky continuously. The general area of their targets is determined with sound-locator apparatus, and searchlights then illuminate the planes. Searchlights are moved by motor vehicles.

The 60-cm antiaircraft searchlight is organic within light antiaircraft artillery battalions, each of which is provided with 12 searchlights. With good visibility conditions, the maximum range of this searchlight is approximately 16,000 feet.

The 150-cm antiaircraft searchlights are organized into special searchlight battalions, each provided with 27 searchlights. With good visibility conditions, their maximum range is approximately 25,000 feet.

(4) Air Obstacles

Barrage balloons supplement the defense provided by antiaircraft artillery, especially around important objectives. They are installed within, as well as around, the defended objective.

The mission of air obstacles, depending on their method of employment and altitudes, is to defend against high-level, low-level, or dive-bomber attacks.

c. Self-Defense of the Troops against Air Attacks

Troops of all arms, as well as the services, use their own light and heavy machine guns against low-altitude attacks at ranges of less than 850 yards. All light and heavy machine guns are provided with supplementary equipment for firing at air targets. All troops use small arms against low-altitude attacks up to ranges of 550 yards.

d. Employment

Several antiaircraft battalions may be assigned to a regimental commander, who, as far as the antiaircraft artillery is concerned, is placed directly under army command. The antiaircraft artillery attached to a corps is placed under the senior antiaircraft officer, who is then designated as the "corps antiaircraft artillery commander." The corps regulates the employment of the corps air units and corps antiaircraft artillery, as well as their cooperation with the aircraft warning service, in accordance with the orders of the army commander. One or more antiaircraft battalions may be placed under a corps, or, in exceptional cases, a division. Then, if no higher staff is available, the "antiaircraft artillery commander" has the mission of advising the ground force commander on all questions concerning: antiaircraft defenses, the employment of subordinate air and antiaircraft forces in accordance with the plan of action, and the execution of the pertinent orders of the ground force commander.

Normally, the antiaircraft artillery strength is concentrated around and on the most important and most critical points. Accordingly, the ground and air situations determine definite antiaircraft main efforts, which must usually be made at the expense of exposing a few less important points. March movements, for example, can generally be defended only at a few specially dangerous places, such as bridges and defiles, assembly points, and rest areas. On the battlefield, antiaircraft defense is usually most urgently needed to protect the artillery main effort.

The antiaircraft artillery battalion commander is essentially a tactical commander. Because of the widely separated battery positions and the characteristics of the targets, unity of fire control within the battalion is impossible.

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The changing of positions interrupts the fire effect, and therefore it must be given careful attention, and generally should be carried out by echelons.

Pursuit aviation cooperates with antiaircraft artillery. By the concentration of pursuit aviation strength and antiaircraft artillery at decisive points, and by air attacks against hostile airfields, hostile air reconnaissance can be suppressed for a limited time over a limited area. Nevertheless, individual hostile reconnaissance planes may be expected to get through; consequently, even in case of temporary air superiority, camouflage measures should always be effected. In case only weak pursuit forces are available, it is more important than ever that their employment be coordinated with the antiaircraft artillery, so that they may at least impede the normal hostile reconnaissance. Blockading an air area by means of pursuit aviation promises only limited success and results in the excessive use of air strength.

e. Air Signal Troops

A part of the air signal troops (ground force liaison battalions) are placed under the army, and operate actually under the air arm commander at army headquarters. The missions of these units are:

(1) To install and operate communications between the air arm commander and reconnissance aviation and antiaircraft artillery that are directly under him.

(2) To maintain connection with the communications net of the operating air arm, which includes bombardment, dive-bombing, pursuit, and low-flying combat planes.

The establishment of communications with reconnaissance and antiaircraft units in support of corps and division commands is a responsibility of ground force signal units.

Separate air signal units of the operating air arm are employed well forward to carry out the air security and warning service in the zone of operations.

f. Aircraft Warning Service

This service depends on the airplane recognition service and is carried out by the liaison troops.

There is a fixed "German territorial aircraft-warning service" and a "mobile aircraft-warning service" which is carried out by aircraft-warning service companies. This warning service is operated through the air district headquarters commanders, under whom the aircraft-warning service is subordinated.

The fixed "aircraft-warning service net" is mesh-like in character. The distance of individual air guard lines from one another varies between 20 and 45 miles. These distances and lines are established in accordance with tactical considerations. "Air guard stations" comprising observation and reporting stations (6 to 8 miles apart) and "air guard headquarters," comprising plotting and relaying stations, are agencies of the aircraft-warning service.

The motorized aircraft-warning companies supplement and increase the density of the fixed aircraft-warning net. Although usually employed well forward, they may be employed on open flanks and in rear areas.

The reports of the German territorial aircraft-warning service are made by wire, whereas the reports of the motorized aircraft-warning companies are made by radio.

The aircraft-warning service is supplemented by the troop-warning service of the antiaircraft artillery (similar to the German antiaircraft artillery information service). Every active antiaircraft artillery unit observes the air in the area under its jurisdiction with specially trained personnel. Thus, these units as air guards, and their staffs as air guard headquarters, execute, or in some cases supplement, the aircraft-warning service. The reports, after being checked by the antiaircraft artillery battalion, are transmitted to the air arm commander at army headquarters. These reports must contain the following: name or location of observation position; hour the planes were seen or heard; the number, type, nationality, and flight direction of the hostile planes; the altitude of the planes and their range from the air guards (only if this altitude and range are unusually great).

In addition, all troop units must use their own air guards to avoid surprise. These guards give warning by means of calls, horns, sirens, or blinker lamps. If antiaircraft artillery is present, its fire is the most effective warning.

CHEMICAL WARFARE

7. THE EMPLOYMENT OF SMOKE IN COOPERATION WITH COMBAT TROOPS

The article translated below is another chapter from the latest edition of General von Cochenhausen's Tactical Handbook for the Troop Commander (1940 edition).

As far as is known, the German Army does not have a chemical warfare service as such. When smoke is required in limited areas, it is furnished generally by smoke-producing ammunition fired by the combat units' organic weapons, such as artillery and mortars. In operations involving the use of smoke in large quantities, motorized units specially trained and equipped are allotted by GHQ for this purpose. These units are commonly called "smoke-throwing battalions" (Nebelwerferabteilungen). Each battalion is organized, in

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general, into a staff, communication platoon, and three batteries, each composed of two platoons of four mortars each.

The translation follows.

* * *

a. Purpose and Characteristics of Smoke

Smoke is used to conceal friendly troops and installations, and also to blind or deceive the enemy or hinder the effect of his fire. It is preferable to smoke the enemy, if the smoke mission in the given situation can be accomplished with the existing material. The enemy's fire effect is decreased if the smoke covers his riflemen and observation posts rather than his targets. Also, to smoke friendly troops restricts their action and draws the enemy's attention toward them.

Favorable conditions for the employment of smoke are: a steady moderate wind, humid atmosphere, clouded sky, falling temperature, early morning or late evening hours, and bare, even terrain.

Unfavorable conditions for the employment of smoke are: a very weak wind or a calm, a very strong gusty wind constantly changing its direction, dry atmosphere, sunshine, heat, and hilly or covered terrain.

b. Materiel

(1) Smoke Ammunition

Smoke may be produced by special ammunition for artillery and mortars, as well as by ammunition for special weapons. Smoke ammunition is most applicable for use against hostile troops and is least dependent upon the weather. A smoke cloud which is to blind the enemy should be built up as rapidly as possible and maintained with moderate fire.

Ordinary mortars and special gas mortars normally consume less ammunition than cannon or artillery of equal caliber.

(2) Smoke Sprayers and Smoke-Releasing Apparatus

Devices which release a smoke-producing fluid may be used to establish a smoke curtain or a smoke cloud.

The sprayers most commonly used are the small type carried on the back of the individual soldier, and the large type which is moved into position on a hand cart. The small sprayers produce smoke for a period lasting about 10 minutes, and the large ones, for periods lasting from 30 to 40 minutes. The small sprayers can be used by troops either while they are moving or in position.

These sprayers are suitable for rapid use within the combat area of infantry troops. The installation of the large sprayers in the forward parts of the combat zone is time-consuming, and possible only when the terrain is hidden from hostile observation.

Sprayers can release smoke effectively whatever the direction and speed of the wind, and any vehicles equipped with sprayers can release smoke effectively even in a calm atmosphere, providing the vehicles are moving at high speeds. However, if the wind is blowing away from the enemy, such a method should not be used to smoke friendly front-line troops. This method is applicable for smoking the enemy only at short distances (seldom more than 800 to 1,000 yards), and if there is a steady wind toward the enemy.

(3) Hand and Rifle Smoke Grenades

These weapons have a limited effect both as to time and space.

(4) Smoke Candles and Smoldering Material

These develop smoke which resembles fog. The material most commonly used includes small candles that are thrown, or placed, a few paces apart on the ground. They produce smoke for periods lasting about 2 minutes, and are used mostly in such small-scale operations as combat in the interior of a hostile position.

(5) Airplane Smoke Material

Airplanes may drop smoke bombs to screen the enemy for a short time and in limited areas.

Airplanes may also be equipped with smoke sprayers, which, depending upon the type and size of the apparatus, can either lay a flat smoke screen about 300 yards wide and several miles long, or establish a vertical curtain about 200 yards high. Planes so equipped may be used to produce smoke in air combat, or they may release smoke to blind AA weapons or deprive the enemy of ground observation over friendly troops. Because of their rapid employment, and great extension but short duration, such smoke screens are principally suitable for concealing the movement of mobile units.

c. Issuance of Orders for the Employment of Smoke

The influence of weather conditions and the usually short duration of the smoke effect require quick decisions in its employment. Disadvantages are the restriction of observation and the interference with neighboring troops. Artillery and other troops that will be affected by the smoke should be informed of its contemplated use. Independent employment is permitted only in case the effect of the smoke is limited to the area of the command using it. In other cases, the use of smoke is regulated by the higher commander.

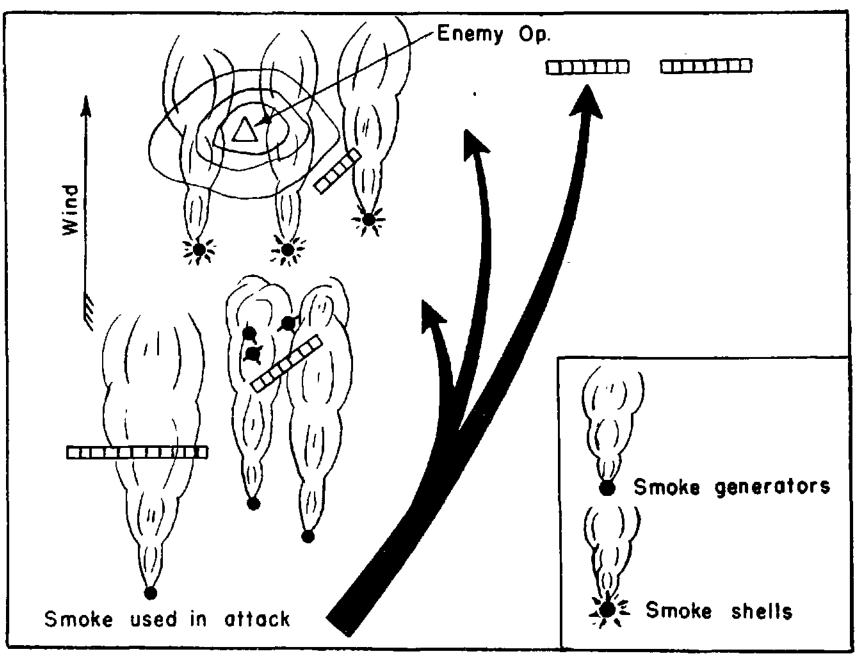
The commander can normally withhold from his subordinate units the permission to use smoke; only armored vehicles may use smoke for self-protection without restriction.

For large-scale smoke operations, army and corps commanders allot to their subordinate units smoke troops with projectors or sprayers, the necessary ammunition for artillery and mortars, and airplanes equipped with smoke-producing apparatus. In general, the division commander regulates the use of smoke and coordinates it with the fire and movement of his subordinate units. Recommendations are made by the smoke-troop commander. The combat order should prescribe what the smoke is to conceal and why. When used to restrict hostile observation, the direction and duration of the screen should also be stated. To insure close cooperation, smoke troops are usually attached to the units to be protected.

d. Use of Smoke in Large-Scale Operations

(1) Attack

Smoke conceals the movements made in preparation for attack and facilitates surprise. Smoke reduces losses, and its use is especially valuable in crossing open terrain and during the initial crossing of a river. Concealed hostile positions, suspected observation posts, and defensive weapons, such as machine guns, can be prevented from operating efficiently. When smoke is used for this purpose, it saves fire power and facilitates the establishment of the artillery main effort. Smoke serves to support the attack in the zone of the main

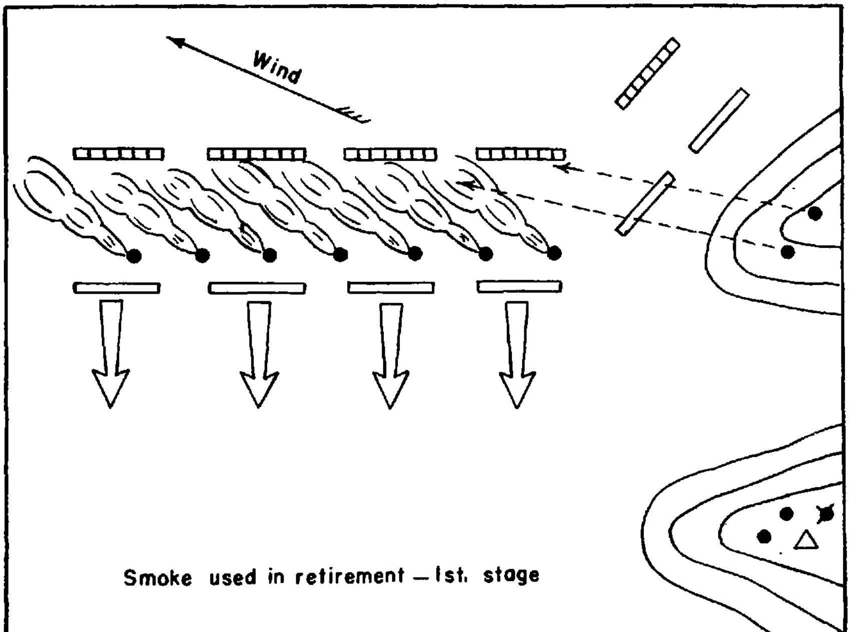


effort, to veil weakness in adjacent zones, and to conceal gaps in the lines.

Most frequently, the attacker uses smoke shells to blind the enemy. Smoke sprayers are seldom used for this purpose, and then only as a temporary expedient, providing the wind is blowing toward the enemy. Sprayers are mainly used to conceal the movements of attacking troops.

(2) Defense

In defense, the use of smoke in front of the friendly artillery observation posts is seldom advisable, because such use blinds their observation. The defender's use of smoke on critical parts of his own position in the event of a tank attack is generally not recommended.

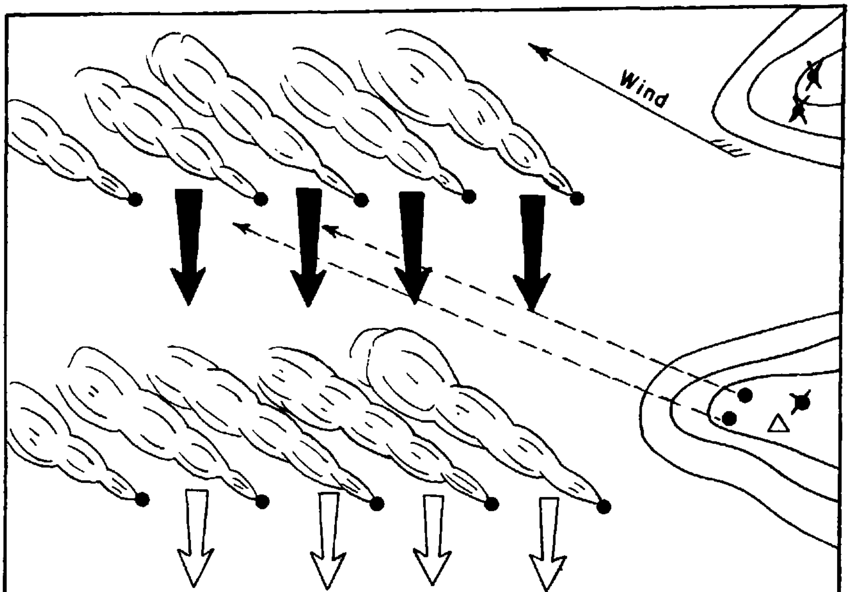


Smoke used in retirement — 1st. stage

Fire from smoke-producing ammunition is a suitable expedient for blinding hostile observation positions. When using smoke in the forward zone to conceal working parties or movements, previous arrangements should be made for observation, from the flank, of the terrain beyond the smoke cloud, and for fire protection against surprise attack by the enemy.

Smoke may be used in the rear of the defender's artillery observation posts, except when the wind is blowing in the direction of the enemy. Such use serves to conceal the shifting of strength, the movement of reserves, or changes in artillery positions; but it will fulfill its purpose only if it completely excludes all observation.

(3) In breaking contact during combat, smoke gives valuable assistance. By providing concealment, it facilitates disengagement from the enemy by day. Whenever possible, the enemy should be blinded by use of smoke-producing ammunition. Ordinarily, the withdrawing troops can also be covered by sprayed smoke, even if the wind is blowing in the direction of the withdrawal. In general, however, the timely employment of smoke sprayers is possible only in case of previously planned preparations for retirement. Naturally, the smoke apparatus will fall into the enemy's hands. The advancing enemy should be held up by observed or planned fire as soon as the smoking or retrograde movement begins, in order to prevent him from using the occasion to launch an attack on the withdrawing troops.



Smoke used in retirement — 2nd. stage

(4) Concealment from air observation requires a great expenditure of smoke ammunition, and therefore is possible only for short periods of time. The establishment of a complete and effective smoke screen can be accomplished only under especially favorable weather and terrain conditions. Combat bridge construction and large ferries cannot be concealed from the air by smoke for long periods of time. Likewise, troop movements can be concealed only during short marches: for example, troops moving from a dispersed or camouflaged formation into natural cover. Smoke makes low-level air attacks more difficult.

(5) Smoke may be used deceptively to divert hostile attention and fire from important positions. For example, in river crossings, it may be used at several places in order to deceive the enemy as to the location of the contemplated crossing. The size of the deceptive smoke cloud must be such as to make it appear to serve an important purpose in the combat situation.

e. Use of Smoke in Small-Scale Operations

In local operations, smoke should be produced by the combat troops' organic facilities, which include smoke candles, hand and rifle smoke grenades, artillery and mortar smoke shells, and smoke sprayers on armored vehicles.

f. Combat in Smoke

Smoke hinders the defense more than the attack.

Troops moving across country in smoke maintain their direction by compass. In order to maintain control, it is often practical to move troops by bounds. In smoke, troops should advance silently and attack resolutely. The decision is secured in close combat. Upon contact with the enemy, attack him immediately with the bayonet, hand grenades, and battle cries.

In defense, the direction of fire should be definitely established and a fire plan prepared in advance, thereby guaranteeing effective fire even in case of a surprise attack supported by smoke. In case of hostile smoke, gas masks are used until it is definitely determined that the smoke is not mixed with toxic agents.

Front-line troops should open fire individually against hostile smoke only if it is directly in front of their own position; the enemy may be displaying smoke to divert fire from his own important positions. Combined fire will be ordered by higher authority. Friendly air reconnaissance should determine definitely what the hostile smoke conceals.

* * *

Comments: In order to disperse the hostile fire that smoke attracts, it should cover the maximum area. However, the possible hindrance to friendly artillery observation, fire, and troop movements should always be taken into consideration in decisions to use smoke. Even if handicapped by smoke, artillery can continue to execute its prepared fires, but it cannot recognize or fire effectively upon new targets. In view of the above considerations, the Germans have not emphasized the development of smoke-spraying vehicles for use in support of front-line units, but prefer to use weapons firing smoke-producing ammunition.

The Germans believe that it is generally unnecessary for the defender to leave his cover and move into view of an attacking enemy. Therefore, the use of smoke by the defense is usually undesirable, since the strength of the defense depends mainly on the effectiveness of aimed and observed fires.

It must be assumed that the purpose of smoke during a daylight withdrawal will be immediately recognized by the enemy, who will increase his efforts to push after the retiring troops. Smoke alone will not hold the enemy away. Therefore, in such situations, German artillery and other heavy weapons

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supporting a withdrawal will increase their fires against favorable targets, previously selected and registered. These weapons will also be prepared to place aimed and observed fire upon the advancing enemy as he emerges from the smoke.

It has been noted in this and other texts, as well as in accounts of combat experiences, that the Germans frequently use smoke as follows: to conceal movements of armored and foot troops, especially from the flanks; to deceive the enemy, by placing smoke at seemingly logical and important points; and to reduce the ammunition expenditures required to neutralize hostile weapons, especially those which cannot be effectively engaged by armored vehicles, infantry weapons, or artillery.

Whether the use of smoke brings the intended results depends upon the ability of the commanders to achieve a skillful cooperation between the effect of the smoke and the fire and movement of the combat troops.

8. MUSTARD GAS AND INCENDIARY BOMBS

A British report on chemical warfare stresses the fact that it is technically possible and tactically valuable to use mustard gas bombs with incendiary bombs in such a way that the areas covered by the two types overlap, or at least are adjacent.

The tactical value of this combination lies in the hampering of the fire-fighting services by the presence of contamination in the area where they must work, and in the threat of casualties among personnel.

The report emphasizes that the mustard gas will cause confusion and delay among the fire-fighting troops, especially at night, thus allowing the fire to spread. No important proportion of the mustard gas will be destroyed by fire.

9. NOTES FROM A SECOND GERMAN ARMY TRAINING DIRECTIVE

The following notes were translated from a captured German document. They are the commanding general's views on various phases of German Army training. The section given here concerns tactics.

* * *

When expecting contact with an enemy reported to be in approach march formation, the troops should advance, depending upon the situation, either in small columns or completely deployed. Whenever possible, supporting weapons should be in position to render assistance. The approach march formation develops into the attack formation when enemy fire demands such action.

Generally, division orders will assign one or more objectives for the division as a whole, as well as final objectives for the infantry regiments. Only in exceptional cases will intermediate objectives for the infantry regiments be assigned by the division order.

In spite of my directives, almost without exception, a triangular formation has been adopted for the purpose of constituting a "point of attack," although it is clear to every one that an attack carried out by an infantry regiment whose units advance in a triangular formation is, as a matter of fact, led merely by the light machine gun of a single combat group, and, as a result, is subjected to heavy enemy fire and doomed to failure. I invite your attention again to the fact that the triangular formation must not become a fixed rule.

It is a rule that an infantry regiment should constitute several "points of attack," particularly against a well-organized enemy defense.

Narrow and deep formations make it easier for the subordinates, and especially for the battalion commander, to make use of his heavy infantry weapons. The organization of the fire of these arms and the synchronizing of their fire with the advance of the troops are the supreme test of the battalion commander.

The lessons of the World War, confirmed by those of the campaign in Poland and in the West, that widely deployed formations avoid severe infantry losses, must always be borne in mind. They must be resorted to even on a terrain that is not under the direct observation of the enemy (depressions, wooded areas, etc.) but which can be brought under his fire.

The junior officers and noncommissioned officers of the infantry must realize that the combat formation of their respective units will be subjected to continual changes because of the terrain and enemy fire. The shaping of the formation to meet the new situation rests with every subordinate commander.

Staffs forced to move on foot during an advance should avoid bare ridges or open spaces. Should it be absolutely necessary to cross them, widely deployed formations should be used.

The advantage fog affords to the attacker will be lost if the commander does not require that it be fully utilized in moving against the enemy position.

In darkness, fog, or large wooded areas, a compass is the most simple means for maintaining the direction of attack. It is frequently the case that the direction of march is fixed by the battalion rather than higher headquarters.

To have the reserves follow at a prescribed distance is wrong; and to leave them at a fixed point during the development of the action is frequently inadvisable.

The reserves should be moved from one point of the terrain to another only when so ordered and, until the moment they are engaged, their commander or the second-in-command should be with the commander at whose disposal they have been placed.

10. ORGANIZATION, TRAINING, AND EMPLOYMENT OF GERMAN PARACHUTISTS

a. Organization

German parachute units are a part of the German Air Force and come under the immediate control of Flieger Division VII. They consist of parachute rifle regiments together with parachute antitank, antiaircraft, signal, engineer, medical, supply, and other auxiliary units. Four parachute rifle regiments have been definitely identified, and there are possibly six in existence. Including the auxiliary units, there is thus a total of 18,000 to 20,000 fully trained and equipped parachutists.

Air-landing operations come under the control of Fliegerkorps XI. In a large-scale air-landing operation, the corps would command not only the parachute units but also glider troops, air-landing troops, and transport aircraft as shown below.

Fliegerkorps XI

(Headquarters and Signals)

Storm Regiment	Fliegerdivision VII	Army Units
Glider Units	Parachute Units	Air-Landing Troops

Parachute rifle regiments are organized like infantry regiments. This fits in well with the organization and tactical use of the transport squadrons. The basic organization is a section of 12 men armed with 2 light or heavy machine guns, rifles, and revolvers; or 8 men with a heavy mortar. Either load is suitable for one Ju-52 airplane. Three sections form one platoon which is carried in a flight, or Kette, of three Ju-52's. A rifle company consists of 12 sections, which are conveniently carried by a German squadron, or Staffel. A battalion comprises 3 rifle companies and 1 weapons company, with a total of about 600 parachutists and 200 non-parachutists. This is the load, including battalion headquarters, of a GAF Gruppe of 53 Ju-52 transport aircraft. Battalion organization is shown in the accompanying diagram.

b. Parachute Jumping Course

Originally this course lasted 6 weeks, was then reduced to 4, and is now compressed into 16 days. During bad weather it is not possible to complete the courses in the prescribed period, as initial jumps are carried out only under ideal conditions. During the winter 1941-1942, the weather was so bad that one school was closed for several weeks.

The instruction given has not altered from that of the longer course but is necessarily much more intensive. Previously, more time was spent on ground exercises before jumping was attempted.

For the first 10 days of the course, instruction includes the following:

(1) Lectures on parachute packing, theory of parachute control during descent, etc.

(2) Practice in parachute packing as much as 3 hours a day.

(3) Instruction in movement and jumping out of a skeleton Ju-52.

(4) Jumping from a platform approximately 9 feet high on to matting about 4 inches thick. Full jumping uniform and equipment (minus parachute) are worn. The height of the platform is not varied. Men are taught the correct method of falling, this being practiced for about 1 hour a day.

(5) Practice on a suspension device. This includes instruction in control of a parachute during descent, how to counteract drift, how to maintain a normal hanging position, and control of a parachute on landing. This is practiced for 2 hours daily. The suspension device is moved by artificial currents which produce conditions experienced during an actual descent.

On each of the last 6 days of the course, jumps are made from altitudes starting at 900 feet and gradually reduced to 350 feet. The number of training jumps is six. For the first five jumps, only parachute clothing is worn; for the sixth, full equipment and rifles are carried, and a light machine gun is dropped with the section.

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ORGANIZATION OF A PARACHUTE RIFLE BATTALION

- Bn Hq
- Com Plat
- Eng Plat
- Rifle Co
  - Hq
  - Rifle Plat
    - Rifle Sqd
      - Sqd Ldr
      - Asst Sqd Ldr
      - 2 LMGs (3 men per gun)
      - 4 Riflemen
    - Rifle Sqd
    - Rifle Sqd
    - L Mort Sec (one 50-mm mort)
  - Rifle Plat
  - Rifle Plat
  - HvMG Sec (2 HvMGs)
  - AT Rifle Sec (2 AT guns) (Model 41)
  - Supply Det
- Rifle Co
- Rifle Co
- Wpns Co
  - Hq
  - Hv Plat
    - HvMG Sec (2 HvMGs)
    - HvMG Sec (2 HvMGs)
  - Hv Plat
  - L Plat
    - LMG Sec (2 LMGs)
    - LMG Sec (2 LMGs)
    - LMG Sec (2 LMGs)
    - L. Mort Sec (one 50-mm mort)
  - Hv Mort Sec (two 81-mm morts)
  - AT Rifle Sec (2 AT guns) (Model 41)
  - Supply Det

NOTES:

(1) PWs state that in Africa each Rifle Co was to have 2 HvMGs attached from the Wpns Co. This would seem to be in conformity with present practice in German Inf Bns in Africa. This would make the total of 4 HvMGs in a Rifle Co.

(2) Prisoners are at variance concerning the number of LMGs per Rifle Sec but from previous evidence the figure is believed to be 2.

(3) The number of AT guns in an AT Sec of the Wpns Co is uncertain. As it seems to be only a section however it would be most unlikely to have more than 2. This would conform with the AT Rifle Secs in the Rifle Cos.

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The following jumping drill is taught. Besides the pilot and gunner, there is an Absetzer (controller) who issues the orders to jump as follows:

(1) "Get ready."

(2) "Get ready to jump."

(3) Whistle---blown by the controller.

The men jump in the following order:

(1) Section leader or assistant leader.

(2) Three light machine-gunners.

(3) Four riflemen.

(4) Three light machine-gunners.

(5) Assistant section leader or section leader.

c. Employment

In full-scale air landings such as in the Crete campaign, parachutists and gliders with air-borne troops have their place in the operations. The glider troops are used in the initial phase to attack batteries and antiaircraft gun positions and silence them in preparation for the arrival of the parachutists. (In Crete the parachutists arrived 15 minutes after the gliders.) On landing, the parachutist discards his parachute, collects his equipment, and assembles with his section as quickly as possible. In the first few minutes after landing, while under the shock of the jump and before they have regrouped, parachutists are highly vulnerable. In many cases where they have been attacked immediately after landing, whole units have been wiped out. If not attacked, however, the parachutists rapidly collect together and proceed to the attack. In this they frequently have the advantage of surprise, while their very heavy fire power, particularly at short range, makes them formidable opponents. One of their first objectives is frequently an airdrome or landing area suitable for Ju-52's carrying troops. These troops usually consist of infantry or mountain regiments. These reinforcements join the parachutists and continue operations against the opposing forces. Further supplies and reinforcements continue to be landed by air as required.

Smaller-scale parachute operations may be undertaken with the object of seizing key points, such as roads, bridges, strongpoints, etc. in the rear of the enemy. These attacks are carried out particularly in conjunction with land offensives when the parachutists may expect to have to hold their position only for a few hours, or at the most, a day or two, before being relieved by their advancing forces. The number employed in such operations may vary from a platoon to a battalion in strength,according to the objective.

A common use of parachutists in connection with an attack is to drop individuals or small groups behind the enemy lines. The object is to cause the maximum amount of disruption and panic by sabotage of communications (cutting telephone wires, blowing up railways, etc.), issuing false orders, spreading rumors, misdirecting traffic, etc. These agents may be disguised and have a perfect knowledge of the enemy's language.

11. FURTHER NOTES ON THE BURMA CAMPAIGN

The following are some further items from British sources on the experiences gained in the Burma Campaign. Other material on this subject was included in Tactical and Technical Trends, No. 9, p. 15.

a. Pace of Fighting

The British reports stress the "absolute necessity" for an adequate flow of reinforcements, permitting the interchange of units in the front line so that troops will have a rest every 3 or 4 days. The Japanese Army (it is stated), will sacrifice manpower and use fresh troops in repeated assaults to gain an objective.

b. Arming of Service Troops

In the fighting in Burma, lines of communication were very long and exposed, and the Japanese made dangerous attacks on rear areas by flanking or infiltration groups. Under these conditions, it was regarded as absolutely necessary that all types of troops--engineer, signal corps, ordnance, etc.--should be provided with, and trained in the use of, rifle, bayonet, grenades, machine guns, and Tommy guns.

c. Equipment for Jungle Fighting

The following recommendations were made:

(1) Troops should be armed at all times. Every man should be issued a bandolier, which he can carry about with his rifle wherever he goes. Full equipment need not be worn at all times; in an emergency the important thing is to have a rifle and 50 rounds.

(2) Every man should carry at least one light machine-gun magazine, in addition to his own ammunition.

(3) Some form of knife should be issued to troops in jungle country.

(4) Individual intrenching tools should be carried by every one, but should be modified to exclude the pick end and to make the digging end slightly stronger (Note: this refers to British types of tools). These would be supple-

mented in the battalion by ordinary picks and shovels.

d. Infantry Patrols

(1) Length of Patrols

Throughout the Burma Campaign, infantry were at all times called upon for heavy patrol duties. The number and length of patrols were increased by the enclosed nature of the country (restricting observation), by lack of reconnaissance aircraft, shortage of mobile troops, and the Japanese aptitude for using little known and even unmarked trails. The arrival of an armored brigade did little to help reduce the burden put on the infantry; in the early stages, this brigaoe operated as a separate mobile force ahead of the infantry, and later was employed for shock action or distant patrolling.

These factors not only made patrol duties heavy, but increased beyond ordinary requirements the depth to which patrols were required to operate. Bren-carrier patrols to a distance of 13 miles were commonplace, and sometimes infantry on foot were called upon to patrol as far as 15 miles ahead of forward units. The necessity for frequent carrier patrols, at long distances, led to the carrier vehicles being treated as armored cars--an unsuitable role. Many were lost on roads and trails in close country through grenade or mortar attacks, or through destruction of the crew by snipers armed with automatic weapons and concealed in trees.

(2) Functioning of Patrols

When infantry patrols are sent on foot for such long distances from their nearest support, very high morale is required, as well as leadership above the average. If a patrol returns prematurely or fails to carry out its mission, this may vitally affect the security of the main forces.

In a country where Fifth Columnists are numerous, British sources recommend special precautions, such as moving only at night and avoiding villages.

(3) Forms of Patrols

In some cases, infantry in trucks accompanied armored carriers on long-distance patrols. It is doubted whether this was good practice, since the infantry was vulnerable to attack and the trucks had limited capacities for cross-country patrol work.

On one occasion, a 3-inch mortar was man-handled forward by a patrol and achieved a notable success, the enemy being completely unprepared for fire of this type forward of the British positions.

(4) Sending Back Information

Lack of equipment for communications added to the difficulties of patrol work in close country. Information was often slow in getting back from the patrols. Retirements of the main forces often had to be made on short notice, and patrols could not always be notified of the movement. Sound signals (prearranged fires, etc.) were not always a practical method of overcoming this difficulty.

(5) Possible Use of Cavalry

Neither side employed cavalry for patrols. The British report suggests that cavalry using small native ponies would have been invaluable in this campaign. For patrol work, it is suggested that the mounted infantry should have a high proportion of light machine guns and submachine guns carried with the troops. Mouhted patrols could use pack wireless and Jeeps to communicate information and receive orders. Specifically, the report suggests that three companies of mounted infantry, plus a company of armored scout cars (U.S. type) having some heavy mortars, would make the ideal reconnaissance unit or light covering force for a division.

(6) Maps

Without adequate maps, long distance patrols found great trouble in carrying out assignments in difficult country.

e. Village Fighting

Village fighting was involved in a majority of the actions in this campaign.

(1) Character of Burmese Villages

They consist of bamboo houses, with the living quarters raised off the ground and entered by a ladder. Cattle and equipment are kept on the ground underneath. The roofs are thatched with leaves, and holes can be easily made in them. Houses are generally separated from each other by bamboo stockades, often with sharpened ends, and the whole village is usually surrounded by a stockade. Cactus hedges are common. Villages, if lacking in bamboo or other cover, are usually built in squares. Where cover is abundant, the village is irregular. There is plenty of cover for concealment in the ordinary village.

Village sanitation is deplorable. The best water supply (wells) was usually in the villages; this led to troop concentrations in or near villages, and so to village fighting. The best water is found at the village temple.

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(2) Japanese Tactics

The Japanese shock-troops were adept at infiltrating into villages and concealing themselves. They used trees extensively; also green camouflage nets. They were skillful in taking cover in houses and frequently used the roof as a sniping position, after knocking out a small hole, by supporting themselves on rafters. Culverts, bridges, sunken roads, bamboo clumps, wicker baskets, rice dumps, trenches under houses--all were likely hiding places.

(3) British Tactics

To clear a village occupied by the Japanese required bold and resolute leadership. The roads were to be avoided. Unless the village ran into the jungle, a straightforward advance through the houses on both sides of the road paid best. Attack, in two waves, should include a firing party with automatic weapons followed by a mopping-up party--both with plenty of bombs.

If snipers were not caught by the first wave, they could be dealt with by setting fire to houses and other cover--in such a way as not to interfere with the main operation. Mopping-up had to be thorough, and the houses searched from ground to roof; otherwise, the Jap merely "fades out" and "fades in" again at will. When the village is flanked with jungle, it is suicidal for attacking troops to advance across the more open spaces of the village with the flanks not cleared. An encircling movement through the jungle into the village will bring fewer casualties. In such a maneuver, objectives must be strictly limited. As each successive objective is gained, there must be a pause for reorganization, selection of the best objective (to be clearly stated to all troops), and replenishment of ammunition. These encircling movements can be supported by frontal covering fire with automatic weapons.

Tanks can be effectively used in support of infantry in clearing a village. They advance down roads echeloned back from each wave of infantry. They are thus comparatively safe from antitank grenades, and the infantry ahead of the tanks can deal with antitank weapons covering the road. Tanks often obtained a favorable target by moving along the flanks of villages.

Armored carriers can be used in a similar way, if tanks are not available. Both tanks and carriers can easily make breaches in stockades by charging them.

(4) Miscellaneous

The searching fire of mortars, well in front of advancing infantry, is effective in making the Japanese give ground.

In firing a village (to improve fields of fire), it should be remembered that dumps of rice will take 2 to 3 days to burn out. A dry bamboo house will burn out in 20 to 30 minutes. The "plop" of burning bamboo shoots has often been mistaken for enemy small-arms fire.

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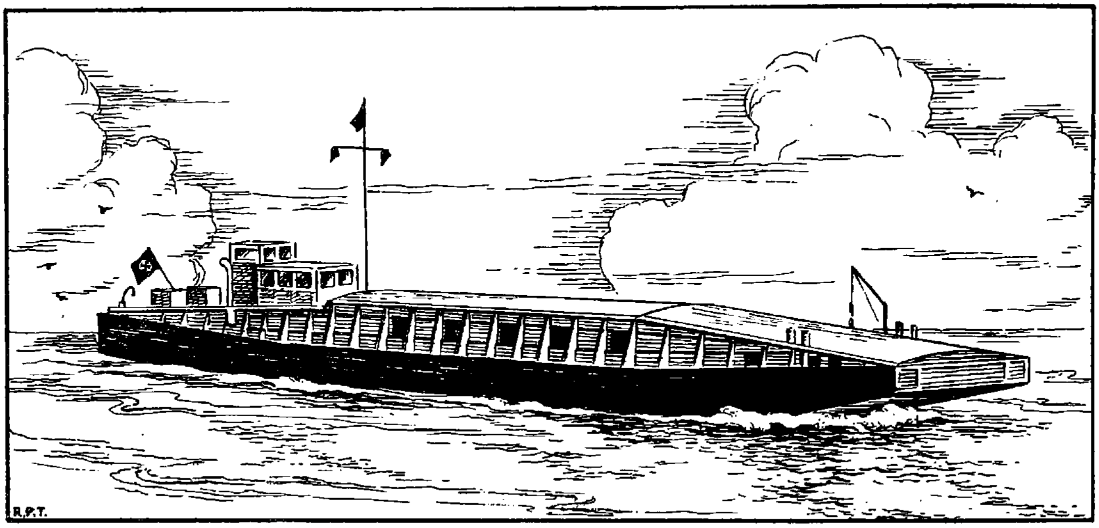
12. GERMAN TANK-LANDING CRAFT

This information concerning tank-landing craft, called "F" boats, is based on the examination of a vessel wrecked in Salum, and on observation of others passing through the Dardanelles.



a. Detail

(1) Construction

Width of hold is 13 feet, but the width of the ramp is 11 1/2 feet and immediately forward of this, the passage is only 10 1/2 feet wide. This will permit a free passage of tanks up to at least the Pz Kw IV (22 to 24 tons). The superstructure is about 8 feet above the deck. The bows rise clear of the water about 17 feet.

The front opening is covered with thick corrugated iron sheeting on strongbacks and held down by fore and aft securing strips on each side.

The bridge is of 1/2-inch plating about 5 feet high in front and on both sides; the aft side is of wood, possibly enclosing about 4 inches of concrete. There is no top to the bridge.

The top and sides of the hold are not armored; the plating is about 1/8 inch thick.

(2) Equipment

There is no navigational or communication equipment on the bridge. The wheel is on the bridge and works the tiller through gears and chains. There is no steering engine. Two hauling-off kedges worked by hand winches are fitted

on each quarter.

There are no watertight doors in the hold.

Provision is made for the carrying of troops; there are five large doors on each side from the upper deck to the hold, and there are folding benches in the hold along the side.

(3) Armament

No armament was found in the wrecked craft; however, there was some evidence suggesting that the craft was probably armed with one 75-mm gun forward of the bridge, and two machine guns, one forward and one aft.

(4) Performance

The craft displaces possibly 320 tons and has a carrying capacity of about 120 tons. It is able to carry from four to seven tanks, according to size.

Power is believed to be furnished by three Diesels developing 130 hp each. Estimates of speed range from 7 to 12 knots. It is known that passage through the Dardanelles was made at roughly 8 knots. The range is unknown.

(5) Seaworthiness

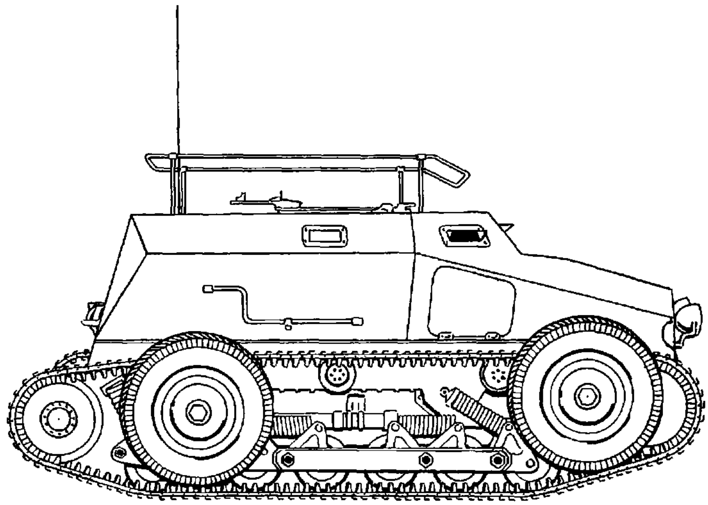
Four of these craft are reported to have traveled under their own power from Sicily to Benghazi by easy stages, stopping at Tropani, Pantellaria, Lampedusa, and Tripoli. One was reported to have been wrecked by rough weather. They have also gone through the Dardanelles, probably from Varna to the Aegean.

(6) Building Yards

Most of these craft are being built in the Low Countries from standard parts, and it is believed that sections can be transported by rail and assembled anywhere.

13. GERMAN LIGHT ARMORED OP VEHICLE

A description has been received of a light armored OP vehicle (Sd Kfz 259) mounted on a wheel-and-track suspension. (See accompanying sketch.)



LIGHT ARMOURED O.P. VEHICLE

The four wheels can be raised or lowered by means of arms, so that the vehicle may run on its tracks over rough ground, or on its wheels along roads. Front, side, and rear plates are sloped to the vertical, while the top is horizontal. An observation hatch is fitted in the roof; slit openings, together with slit opening flaps, are located in the sides and front. A door is fitted in the back for the crew, while a small door, probably for the driver, is to be found on the right side.

Radio is fitted for communication with the gun positions, but there is no evidence of armament or optical instruments, although it has been reported that a BC scope is fitted. This instrument has an azimuth scale.

There is a crew of five, believed to consist of a battery commander, radio operator, observer, chauffeur, and one NCO.

14. VULNERABILITY OF GERMAN TANKS

When enemy armored force vehicles are attacked at close quarters with incendiary grenades, the air louvres are very vulnerable. It is therefore important that differentiation be made between "inlet" and "outlet" ducts, since obviously a grenade thrown against an exhaust opening will be less effective than one aimed at an inlet, which will draw the inflammable liquid into the vehicle. If the engine is not running, all openings are equally vulnerable.

In general, it may be said that in the Pz Kw II and III tanks the best targets are the flat top-plates of the rear superstructures, since the air intakes are located there. The side louvres in these tanks are invariably protected by a vertical baffle. On the Pz Kw IV, the left side ports are intake and thus more vulnerable than the right-hand exhaust ports.

MEDICAL

15. MEMORANDUM ON THE USE OF BENZEDRINE AND METHEDRINE IN WAR

Benzedrine (also called Amphetamine) and Methedrine (German equivalent Pervitin) are substances belonging to the group called analeptics (restoratives). For practical purposes the actions of these drugs are the same, but 1 dose of Methedrine is as potent as 1 1/2 doses of Benzedrine, weight for weight. Their chief action is to stimulate the higher activities of the brain, showing itself especially in decreased sensations of tiredness and fatigue, and in a disinclination and inability to sleep. The administration of Benzedrine does not increase the mental or physical efficiency of a man who is not tired, and Benzedrine should not be taken with this object.

Mention may be made here of the trend of German reports on the use of analeptics. In the latter half of 1941, these reports were enthusiastic, but toward the end of the year warnings commenced to appear, and in the early months of 1942 reports tended to be definitely against their use except under rigid control. The substance in use was Pervitin. (See Tactical and Technical Trends, No. 5, p. 32.)

The effect of these substances on troops has now been studied in the laboratory and in the field, and the following conclusions have been drawn by British medical authorities.

(a) The valuable effect of Benzedrine* to individuals engaged in war operations is to reduce the desire for sleep, and the fatigue which results in loss of efficiency and makes difficult the continuation of essential duties.

(b) Circumstances may thus arise in which the administration of Benzedrine may be advantageous for skilled personnel when they are severely fatigued and unable to continue at a reasonable level of efficiency without an additional stimulus.

*Where "Benzedrine" is written, "Methedrine in equivalent dosage" may be substituted except where this is obviously inappropriate.

The use of Benzedrine should be confined to emergencies or crises, and it should not be taken regularly.

The decision to give Benzedrine must only be made in circumstances when there is reasonable expectation that the emergency will be at an end within 12 hours.

(c) No person whose duties involve the making of difficult decisions, should be permitted to take Benzedrine in a crisis unless he has tested his reactions to it previously.

(d) Benzedrine must not be given indiscriminately to large bodies of troops.

(e) A single dose should not exceed 10 milligrams. A dose of 5 mg may be repeated once or even twice at intervals of 4 to 6 hours.

If an individual is of the opinion that a dose of 10 mg does not produce appreciable effects upon him, the use of the drug should be given up.

(f) The administration of Benzedrine should be under the control of a medical officer.

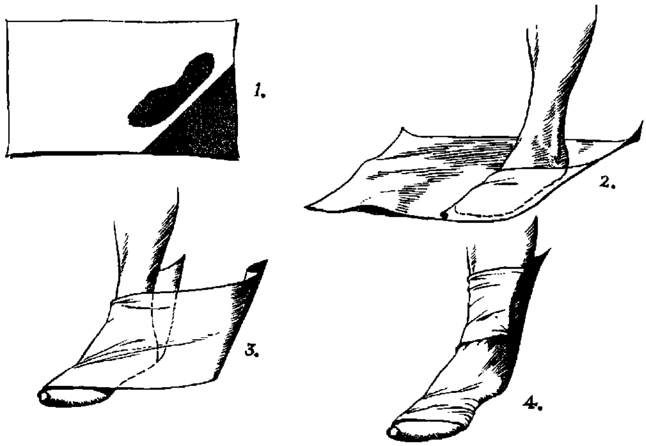
16. FOOT BANDAGES FOR MARCHING

Despite the increasing importance of motor movement in war today, in the final analysis a soldier depends on his own two feet to reach his objective; hence attention to the care of his feet can not be too greatly emphasized.

The Germans take special measures to protect the feet of their troops by the use of bandages. They march long distances in heavy and rather roughly made boots with little foot trouble.

The following method of bandaging prescribed for the Hungarian Army and Labor Corps is also used in the German Army. The Hungarian does not wear the German boot but instead a high shoe with a flap at the top, which straps around the leg well above the ankle outside the breeches and holds them in place. Ordinary light socks are worn beneath the bandages.

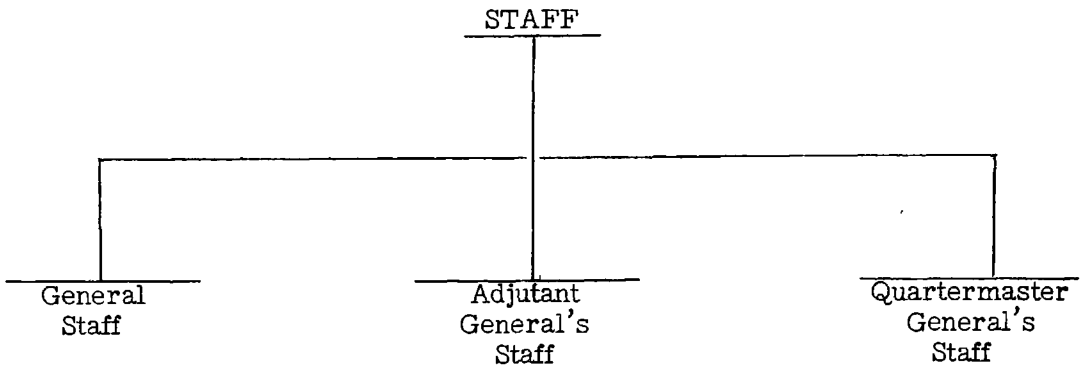
The bandage is a rectangular piece of light flannel (probably cotton) some 24 x 14 inches in size. Its winding is illustrated for the left foot, which is placed on the rectangular cloth as shown in figure 1 of the accompanying sketch.



Then the shaded corner area is folded over the foot and the corner itself is held under the ball of the foot, as in figure 2. As the remainder of the cloth is wrapped around the arch and instep (figure 3), the foot is moved forward a bit as in thrusting into a shoe, until the big toe is flush with the edge of the hole formed by the forward edge of the cloth in figure 3. Thereafter, the winding about the ankle is completed as shown in figure 4, and the end may be fastened at the top with a small safety pin, or left to hold by friction if the entire winding has been tight enough. The winding is in general not very tight, although this varies to suit the individual. Too tight a winding means interference with blood circulation, and too loose means no support of the arch and ankle.

17. NOTES ON THE BRITISH GENERAL STAFF, ARMS AND SERVICES

a. The Staff is divided into three main parts as shown below:



(1) The General Staff, also known as the "G" Staff or "G.S.," is responsible for operations, intelligence, training, and coordination. At the War Office and other large headquarters, separate branches are established. At headquarters other than the War Office, branches are designated as follows:

G. (S.D.)	--	Staff Duties	(War Office designation -- S.D.)
G. (Ops)	--	Operations	(" " " -- M.O.)
G. (I)	--	Intelligence	(" " " -- M.I.)
G. (C.W.)	--	Chemical Warfare	(" " " -- SD.9.)
G. (Trg)	--	Training	(" " " -- M.T.)

(a) G. (S.D.) Branch is the coordinating General Staff Branch. It is responsible for organization of troops for battle, allotment of priorities of weapons and equipment, policy concerned with organization and armament for battle, etc.

(b) G. (Ops) Branch is responsible for all operation planning, issue of operation orders, etc.

(c) G. (I) Branch is subdivided into three sections -- I (a), I (b), and I (c).

I (a) is responsible for intelligence about the enemy.
I (b) is responsible for all security matters,i.e.,preventing the enemy from obtaining information about our troops and other military matters.
I (c) concerns itself with censorship.

(d) G. (C.W.) Branch is responsible for all questions concerning chemical warfare.

(e) G. (Trg) Branch deals with all training (other than administrative subjects), and prepares and writes exercises.

Note: At headquarters below the GHQ of a force, the "G" branches are progressively combined, e.g., S.D. and Trg are combined at Corps Hqs.

(2) The Adjutant General's Staff, also known as the "A" Staff, may be described as the foster father of the individual soldier. It enlists, pays, promotes, looks after his discipline and welfare, supervises his medical care, and eventually discharges or buries him.

The responsibilities of the "A" Staff in no way interfere with or minimize the responsibility of unit commanders for the discipline and promotion of their men.

"A" Branch considers questions of manpower and statistics, and in connection with those subjects it follows that "A" Branch is concerned with the organization of units and manpower generally. There is a very close link with G. (S.D.).

The senior Medical Officer at any headquarters is the adviser to the Headquarters Commander concerning all matters bearing on hospitalization, medical care, hygiene, and sanitation. His approach to the Commander, however, is through the "A" Branch, which coordinates all medical matters from a general staff point of view.

(3) The Quartermaster General's Staff ("Q") outfits the soldier and is responsible for the provision, through its services, of every article (clothing, equipment, weapons, ammunition, food, vehicles, gas, and oil) which is required. It is also responsible for movement, except when troops are actively engaged in operations. Operational movement is controlled by the General Staff.

The subdivision of "Q" duties varies at different headquarters. It is normal, however, to find at large headquarters at least three subdivisions.

(a) Q (Ops) or Q (Maint) provide all that the soldier requires.
(b) Q (ACC) deals with accommodations.
(c) Q (M) deals with movement.

At every British Hqs there is an officer who coordinates "A" and "Q" duties. He is the nearest approach to our Commanding General, Services of Supply.

b. Grades of Staff Officers

Staff officers of the rank of Colonel and above are ungraded and, in general, exercise a coordinating function over a number of branches.

First grade staff officers hold the rank of Lieutenant Colonel and are in charge of branches at the War Office and larger headquarters.

Second grade staff officers are Majors and third grade are Captains. Their titles are as shown below.

	"G" Staff	"A" Staff	"Q" Staff
First Grade	General Staff Officer 1 "G.S.O.1" or "G.1."	Assistant Adjutant General "A.A.G."	Assistant Quartermaster General "A.Q.M.G."
Second Grade	"G.S.O.2."	Deputy Assistant Adjutant General "D.A.A.G."	Deputy Assistant Quartermaster General "D.A.Q.M.G."
Third Grade	"G.S.O.3"	Staff Captain (A) "S.C.(A)"	Staff Captain (Q) "S.C.(Q)"

The titles "G1," "G2," and "G3" when used in the British Service relate to the gradings and not to the branch of the staff as is the case in the United States Army.

c. Arms and Services

Arms and Services in the British Army concerned with administration are as shown. Control by the Staff is as shown below:

STAFF

"G" Staff
- Royal Engineers
- Survey
- Royal Signals

"A" Staff
- Judge Advocate Staff
- Medical Service
- Graves Registration
- Chaplains
- Welfare Activities
- Pay Service
- Provost Service

"Q" Staff
- Salvage
- Quartering
- Ordnance
- Elect. & Mech. Engineering
- Labor
- Movement
- Supply Transport
- Works Services

18. GERMAN INSTRUCTIONS TO TROOPS WHO MAY BE TAKEN PRISONERS

U.S. Intelligence Officers will be faced many times during the present conflict with the problem of extracting information from captured German prisoners. The Germans have, in general, issued to their troops security instructions similar to our own. In the past, however, the British have on innumerable occasions found German prisoners of war to be a rich source of vital intelligence of all sorts (see Tactical and Technical Trends, No. 9, p. 31). Evidence that German military authorities are taking measures to correct the undue loquacity of their troops subsequent to capture is afforded by the following order issued by Marshal Rommel to his troops in North Africa.

"H.Q. of Armored Group,
Africa.

Subject: Behavior of soldiers taken prisoner of war.

"From the attached translation of three enemy news sheets of the 2nd South African Division, it regrettably appears that German prisoners of war have talked inexcusably.

"On receipt of these examples the troops will be instructed in detail how a soldier who is unfortunately taken prisoner of war is to behave. The chief principle at interrogation is, that apart from the personalia (name, date of birth, birth-place, rank) no further information may be given. As response to further questioning, the following will be the reply:

"'I cannot answer any further questions.'

"In conversation with other German prisoners of war who are not known, the greatest reserve will be exercised, as the English use agents in German uniform to listen to prisoners.

"Furthermore, under no circumstances may soldiers who are taken prisoners of war - after the usual destruction of all service papers - allow diaries or letters from home (from which, for example, conclusions may be drawn as to food worries, air-raid damage and the like) to fall into enemy hands.

"The German soldier who is taken prisoner must prove that even in this disagreeable situation he does not lose his proud, superior bearing."

 [redacted] [redacted]

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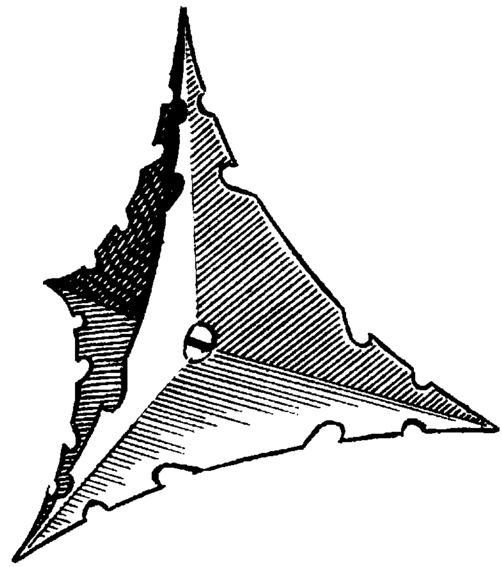
19. GERMAN METAL SPIKES (CROWSFOOT)

German metal spikes of the kind known as "Crowsfoot" (German name, "hedgehog") are reported to have been dropped on motor transport roads, landing fields, and airdromes.



The particular object is made in the shape of a pyramid, each side in the shape of an equilateral triangle recessed in the center. Each side is 3 inches long, and the apex of each triangle is sharply pointed giving 4 spikes in all. The triangle edges are serrated, giving a "fish-hook" effect, so that once the spike has penetrated a tire it would be difficult to remove without tearing the cover.

a. Construction

The spike is made from two pieces of thin-gauge steel (1 mm) welded together, the whole being camouflaged light brown, with olive green stripes. The letters "R" and "L" are stamped on two of the sides, and may refer to the method of packing. There is a hole in the center of the pyramid, which presumably takes a holding rod for packing. (See accompanying sketch.)

A further type has been found of exactly similar construction, but with a base of only 2 1/2 inches instead of 3 inches.

b. Method of Use

The spike is so designed that, theoretically, whichever way it falls, it should rest firmly on its base with one point up. It would appear in practice, however, that when dropped on the ground, there is a good chance of a point penetrating, thus presenting a flattish surface.

c. Container

The container in which the spikes are dropped is a thin-gauge, sheet-metal "bomb" painted dark green and marked with two thin red stripes. The container is 5 feet 6 inches long, including the fins, has a circumference of 4 feet 10 inches, and is fitted with lugs which indicate it can be carried externally by the Ju-87, Ju-88, He-111, and Me-110. Apparently 1,000 to 1,500 spikes can be carried in the container.

A time fuze is fitted so that the spikes are scattered from the air over the road or airfield.

UNCLASSIFIED

20. MAINTENANCE AND REPAIR SERVICE IN GERMAN ARMORED DIVISIONS

The organization of maintenance and recovery units in tank regiments was summarized in Tactical and Technical Trends, No. 10, p. 24. In addition, the German armored division has repair units and workshops which are assigned primarily to the service of the elements in the division other than the tank regiments. However, it is worth noting that some of the divisional repair subsections (see below a. (2)) may include tank mechanics; this suggests that such units may be called upon to assist those assigned to the tank regiments.

The repair services for units other than tank regiments* are performed by:

a. Repair Subsections

(1) Repair subsection "a"

1 motor transport corporal (in sidecar), leader,

1 motorcycle driver (engine mechanic),

1 engine mechanic,

1 chauffeur (engine mechanic).

Vehicles: Motorcycle with sidecar,

1 small repair automobile (Kfz. 2/40).

This subsection is allotted** to units that have not more than 25 motor vehicles (not counting trailers, or sidecars: 4 motorcycles count as 1 vehicle), except for those units (such as battalion headquarters) which are given repair detachments (see below, b.) The companies in the armored infantry regiment, the motorcycle battalion, and the antitank battalion have subsections of this type, as have artillery batteries of all types.

(2) Repair Subsection "b"

1 motor transport corporal (in sidecar), leader,

* These repair units are also found in German motorized divisions, and the scheme of allotment which governs their services applies equally to the motorized division

** The sources give the theoretical principles of allotment of repair units; however, it would be dangerous to assume that the scheme is rigorously applied. There is very little difference in size between some types of repair units (especially the repair detachments); furthermore, the Germans make flexible application of any theoretical organization, and these organizations themselves are subject to frequent modification.

1 motorcycle driver (engine mechanic),

6 engine mechanics (or tank mechanics),

1 electrician (spare chauffeur),

2 chauffeurs (engine mechanics).

Vehicles: 1 motorcycle with sidecar,

1 small repair automobile (Kfz.2/40),

1 medium truck (3 tons), open, for spare parts and personnel.

The principle of allocation of this subsection is not clear from the sources. It is definitely found in the armored engineer company, and may be assigned to the armored radio company of the divisional communications battalion.

(3) Repair Subsection "c"

1 motor transport corporal (in sidecar), leader,

1 corporal (tank mechanic),

1 motorcycle driver,

12 tank mechanics (6 are engine mechanics),

1 electrician,

2 communication equipment mechanics,

1 chauffeur (engine mechanic),

2 truck chauffeurs.

Vehicles: 2 motorcycles with sidecars,

1 small repair automobile (Kfz. 2/40),

1 medium truck, for tires and spare parts,

1 medium crosscountry truck, for personnel.

This subsection is allotted to armored car companies in the divisional reconnaissance battalion.

b. Repair Detachments

(1) Detachment "A"

1 workshop foreman (official, middle grade),

1 corporal (master mechanic and engine mechanic),

2 engine mechanics (assistant chauffeurs),

1 engine mechanic for motorcycles,

1 blacksmith and welder,

1 motorcycle driver (clerk),

4 chauffeurs (1 is an electrician, 1 an engine mechanic).

Vehicles: 1 motorcycle with sidecar,

1 light automobile,

1 small repair automobile (Kfz. 2/40),

1 medium crosscountry truck, open, for motor transport repair equipment,

1 medium crosscountry truck, open, for spare parts, tools, and towing equipment.

This detachment is allotted to headquarters of battalions which contain not more than 125 motor vehicles; also, to headquarters of all motorized infantry regiments.

(2) Detachment "B"

As for Detachment "A", except that there are 3 engine mechanics (assistant chauffeurs) instead of 2.

This detachment is allotted to headquarters of battalions (including artillery) which contain more than 125 motor vehicles (examples: motorcycle battalion, armored infantry battalion, antitank battalion, engineer battalion, reconnaissance battalion).

(3) Detachment "C"

As for Detachment "A", except that

(a) There are 5 engine mechanics (or tank mechanics) instead of 2.

(b) There are 5 chauffeurs (of whom 1 is an electrician, 1 a welder's assistant, and 1 an engine mechanic) instead of 4.

(c) The vehicles include an additional open medium crosscountry truck for tires.

This detachment is allotted to headquarters of battalions (including artillery) where the main vehicles of the subordinate units are special vehicles (armored, half track, etc.) and where all the subordinate companies are armored (The only certain example is the case of the medium artillery battalion.)

c. Special Allotments

One subsection "a" is assigned to each of the following:

Each company of a troop-carrying motor transport battalion (and to the battalion headquarters), motorized bakery companies, and motorized medical companies.

One detachment "A" and two subsections "a" are allotted to the headquarters of the motorized divisional supply services.

d. Workshop Companies

Each armored division* has three workshop companies (not including the much larger workshop company of the tank regiment). Each company includes a headquarters, two workshop platoons, an armory section, and a supply section. The personnel totals 102 officers and men (1 officer, 7 officials, 6 NCO's, 88 EM). The equipment in vehicles is 4 automobiles, 16 trucks, 1 half-track vehicle for towing (and personnel), 4 trailers, and 6 motorcycles.

These workshops carry out all motor transport repairs on vehicles sent back by the unit repair subsections and detachments, excepting jobs which require more than 12 hours work. The latter go to base workshops.

21. STANDARD ITALIAN WEAPONS

The following list of standard Italian weapons does not include arms belonging to other Axis countries but used by the Italian arm as well. The oblique line and number written after the caliber of a gun indicates the length of the bore in calibers, e.g., 75/18-mm howitzer would indicate a howitzer with a bore 18 calibers long. Where "feet" is given after a number in the maximum range column it indicates the maximum vertical range when the weapon is used for antiaircraft. In Tactical and Technical Trends Nos. 9 and 10 the standard German and Japanese weapons have been given.

* A motorized division has two workshop companies, organized as those in the armored division.

Name	Caliber	Muzzle Velocity (foot-seconds)	Max Range (yards)	Rate of Fire (RPM) Theoretical	Rate of Fire (RPM) Practical	Remarks
6.5-mm rifle (Model 91) Mannlicher-Carcano	.256	2,300	3,270	–	–	Weight 8 1/2 lbs without bayonet; 6-rd clip.
6.5-mm Carbine (Model 91) Moschetto	.256	–	1,650	–	–	Weight 7 lbs; 3 ft long with bayonet.
6.5-mm automatic rifle Revelli	.256	2,300	2,180	120	40	–
6.5-mm LMG Breda (Model 30)	.256	2,080	3,270	450 to 500	150	Bipod mount; 20-rd box magazine; one model has tripod mount.
6.5-mm MG Fiat (Model 14)	.256	–	3,270	500	–	Water-cooled; 50-rd box magazine; tripod mount.
7.35-mm rifle (Model 38)	.289	2,490	4,400	–	–	Weight 7 1/2 lbs without bayonet; 3 ft 4 in long; folding bayonet which can be removed and used as a dagger.
7.35-mm Carbine (Model 38) Moschetto	.289	–	–	–	–	Similar to Model 38 rifle.
7.35-mm LMG Breda (Model 38)	.289	2,080	3,270	450 to 500	150	Similar to Model 30 except in caliber.
7.7-mm LMG Breda	.303	–	–	800	–	British .303 ammunition will work in this gun; weight, 27 lbs; often mounted on aircraft.
8-mm MG Fiat (Model 35)	.315	–	5,700	600	–	Tripod mount; air-cooled; fed by 20-rd plate charger; wt, 42 3/4 lbs without mount; some are converted Model 14's.

UNCLASSIFIED

Name	Caliber	Muzzle Velocity (foot-seconds)	Max Range (yards)	Rate of Fire (RPM) Theoretical	Rate of Fire (RPM) Practical	Remarks
8-mm MG Breda (Model 37)	.315	2,600	6,500	300 to 400	—	Tripod mount; air-cooled; life of barrel, 20,000 rds; ball, tracer, incendiary tracer, and AP used.
9-mm pistol Beretta (Model 34)	.350	—	50 (effective)	—	—	7-rd magazine; weight 1 lb 7 1/2 ozs; length 6 in.
9-mm pistol Gelisenti (Model 1910)	—	—	50 (effective)	—	—	Weight 1 lb 12 ozs; length 8 1/2 in; 7-rd magazine. Effective range of this and other pistols is limited by the inaccuracy inherent in the use of such a weapon.
9-mm submachine gun Beretta (Model 38)	.350	—	250 (effective)	570	—	Weight without magazine 9 lbs 1 oz; magazine 10,20, or 40 rds.
10.35-mm revolver Bodeo (Model 89)	.41	—	—	—	—	Cylinder capacity, 6 rds; cylinder does not swing out, empty cases removed one by one; weight 2 lbs; standard for certain MG and gun crews.
12.7-mm MG Breda	.500	—	—	650	—	Weight 67 1/2 lbs; modified version of 7.7-mm Breda MG; extensively used in aircraft.
20-mm Hv AA-AT MG Breda (Model 35)	.79	2,750	6,000	250	120	Fires HE, tracer, and AP; elevation -10° to $+80^{\circ}$; similar AA gun manufactured by Scotti.
20-mm AT rifle Solothurn	.79	2,800	—	—	10 to 20	10-rd clip; weight 120 lbs; length 7 ft.

UNCLASSIFIED

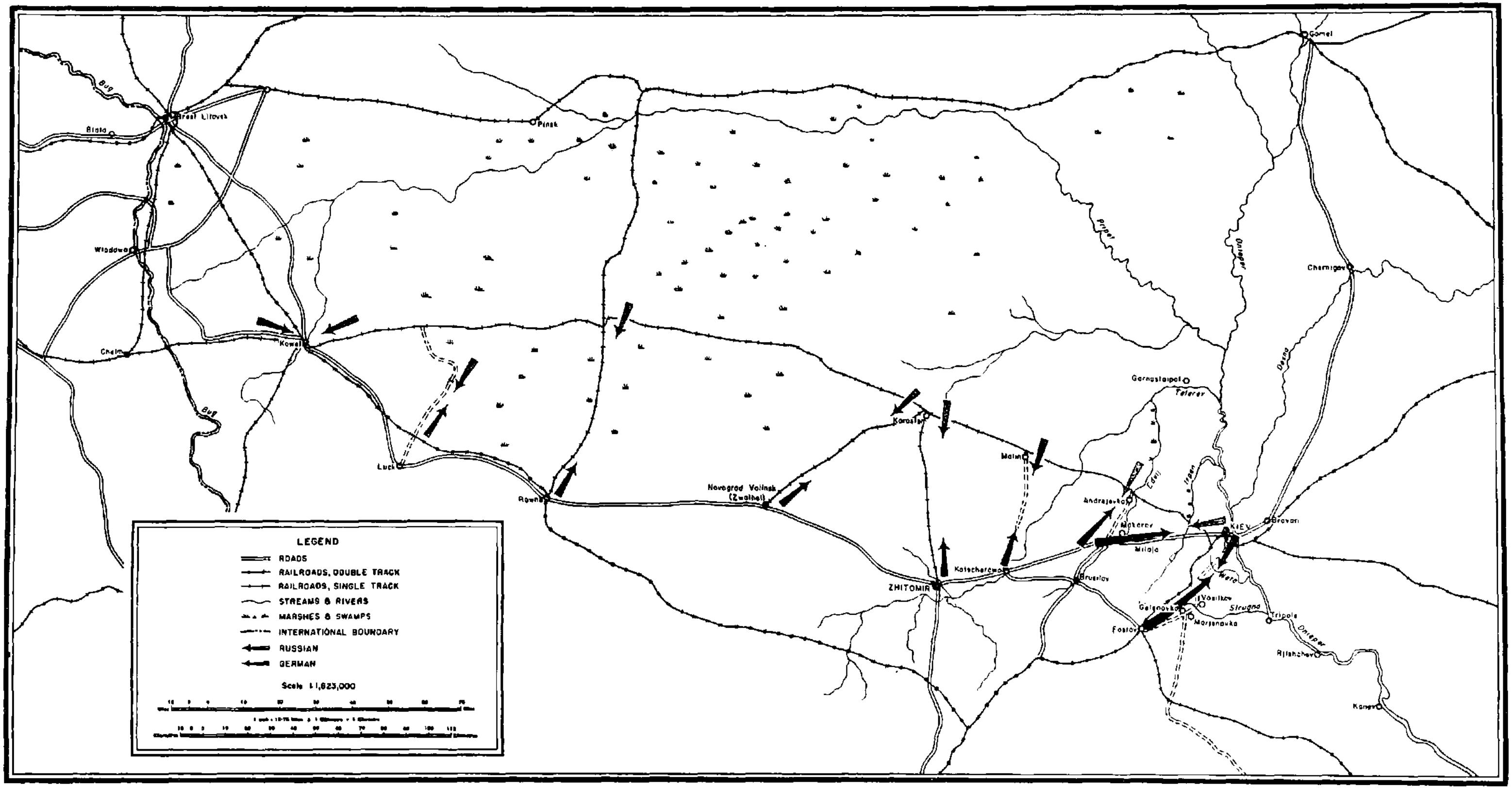
Name	Caliber	Muzzle Velocity (foot-seconds)	Max Range (yards)	Rate of Fire (RPM) Theoretical	Rate of Fire (RPM) Practical	Remarks
37/54-mm AA gun Breda	1.46	2,620	7,700 13,500 ft	125	75	6-rd loading tray; twin-barreled model also in use; mobile platform; barrel, 54 cals; fires HE with time fuze and HE tracer with percussion fuze;a very effective gun.
45-mm mortar Brixia (Model 35)	1.77	272	587	—	30	Tripod mount; weight in action 34 lbs; 1-lb bomb; standard light mortar.
47/32-mm AT gun	1.85	2,050	7,600	—	12 to 14	Barrel, 32 cals; 60° traverse; penetrates 1 1/4-in armor at 90° at 800 yds; also used as infantry support gun.
65/17-mm infantry gun	2.58	1,130	7,100	—	—	—
70-mm infantry gun	2.76	1,160	7,100	—	—	Weight, 850 lbs.
75-mm infantry gun (1934)	2.97	1,180	—	—	—	—
75/13-mm mountain howitzer	2.97	1,240	9,000	—	—	On wheels or 7-load pack; weight, 1,350 lbs.
75/18-mm gun-howitzer (Models 34 and 35)	2.97	1,430	10,300	—	—	Model 34: 1,760 lbs; mountain artillery; Model 35: 2,420 lbs; towed or SP.
75/27-mm gun-howitzer (Model 06)	2.97	1,730	11,200	8	4	Weight in action, 1 ton; elevation -10° to +16°; models 11 and 12 have smaller MV and range, greater elevation and traverse.

Name	Caliber	Muzzle Velocity (foot-seconds)	Max Range (yards)	Rate of Fire (RPM) Theoretical	Rate of Fire (RPM) Practical	Remarks
75/34-mm field gun	2.97	1,650	13,500	—	—	Weight, 2,750 lbs; towed; expected to become standard in mobile division, replacing 75/27.
75/46-mm AA gun (Model 34)	2.97	2,350	14,100 27,200 ft	—	—	Mobile gun.
75/50-mm AA gun	2.97	3,200	17,000 27,500 ft	—	—	Tractor-drawn.
76/40-mm AA gun	2.99	2,620	9,000 15,750 ft	125	70	Water-cooled jacket; elevation -10° to +90°
77/28-mm field gun	3.03	1,710	7,700	—	—	Weight, 2,200 lbs.
81-mm mortar (Model 35)	3.19	836	4,429 (light bomb) 1,640 (heavy bomb)	—	—	Weight, 129 lbs, bomb wt, 7 1/2 lbs; a new improved model has been introduced. A 15-lb bomb is sometimes used.
90/50-mm multipurpose gun	3.55	2,755	19,000 39,400 ft	—	—	Weight, 5 3/4 tons; tractor-drawn.
100/17-mm mountain howitzer (Models 16 and 34).	3.94	1,800	10,000	6	4	Carried in 3 loads.
102/35-mm AA gun	4.02	2,477	14,425 31,100 ft	—	10 to 12	—

Name	Caliber	Muzzle Velocity (foot seconds)	Max Range (yards)	Rate of Fire (RPM) Theor-etical	Rate of Fire (RPM) Prac-tical	Remarks
105/28-mm field gun	4.14	1,850	14,800	—	—	—
105/32-mm field gun	4.14	—	17,500	—	—	—
105/40-mm field gun	4.14	—	18,500	—	—	Weight, 9,900 lbs.
149/12-mm howitzer	5.87	985	7,200	—	—	—
149/13-mm howitzer (Model 14)	5.87	1,130	9,560	—	—	—
149/35-mm gun	5.87	2,200	19,100	—	—	Weight, 15,400 lbs.
149/40-mm gun	5.87	—	24,000	—	—	—
152/13-mm howitzer	5.98	1,240	10,400	—	—	Weight, 7,920 lbs.
152/45-mm gun	5.98	2,730	21,200	—	—	Weight, 36,820 lbs.
210/8-mm mortar	8.27	1,130	9,200	—	—	Weight, 17,600 lbs.
210/22-mm howitzer (Model 35)	8.27	1,730	17,500	—	—	Weight, 34,320 lbs.
280/16-mm coast defense howitzer	11.03	—	12,760	—	—	—
305/17-mm howitzer (Model 17)	12.0	1,790	19,200	—	—	—
305/50-mm coast defense gun	12.0	—	23,650	—	—	—
381/40-mm railway gun	15.0	2,500	26,200	—	—	—

SECTION II

A GERMAN SPEARHEAD IN THE KIEV OPERATION



LEGEND
ROADS
RAILROADS, DOUBLE TRACK
RAILROADS, SINGLE TRACK
STREAMS & RIVERS
MARSHES & SWAMPS
INTERNATIONAL BOUNDARY
RUSSIAN
GERMAN
Scale 1:1,823,000
Gomel
Brest Litovsk
Biala
Bug
Pinsk
Wlodawa
Chelm
Kowel
Luck
Rowno
Novograd Volinsk (Zwiahel)
Korosten
Malin
ZHITOMIR
Brusilov
Fastov
KIEV
Brovari
Chernigov
Desna
Dnieper
Pripet
Teterev
Irpen
Stugna
Tripole
Kanev

A GERMAN SPEARHEAD IN THE KIEV OPERATION*

THE ADVANCE OF THE SIXTH ARMY

GENERAL VON REICHENAU'S ARMY. Among the German forces which crossed the Russian frontier on June 22, 1941, was the Sixth Army, under the command of Field Marshal General von Reichenau. It appears that this army, on the eve of the campaign, was concentrated in German-held Poland in the Biala-Chelm sector immediately west of the Bug River (the Russo-German boundary under the agreement of August 21, 1939). The Sixth Army held the northern flank of the German South Group of Armies under Field Marshal General von Rundstedt. The Sixth Army included motorized infantry and panzer divisions, the Adolph Hitler Regiment (an S.S. unit), and foot infantry divisions, with necessary auxiliary services of all types, and had the support of aviation. "Panzer and motorized infantry divisions, as well as an S.S. unit" are listed by a German source as forming a part of the narrow penetration wedge which was to follow a panzer division spearhead.

In front of Von Reichenau's army was the Russian Fifth Army, which was a part of the Russian South Group of Armies under Marshal Budenny. The order of battle of the Russian Fifth Army is not known.

The German Sixth Army had on its right (southern) flank, the First Panzer Army of General von Kleist, while south of von Kleist was the Seventeenth Army of General von Stuelpnagel. These two armies later became the southern arm of the great Kiev encirclement. Further south, von Rundstedt's forces included Hungarian and Rumanian as well as German troops.

North of von Reichenau was the Center Group of Armies under General von Bock. No army of the Center Group maintained ground contact with von Reichenau after the jump-off from concentration areas; ground liaison between the two armies was prevented by the impassable Pripet marshes. East of the marshes, in the Dnieper Valley, the Second Army under von Weichs and the Second Panzer Army of Guderian later established contact with von Reichenau and became the northern arm in the Kiev encirclement.

THE PRIPET OR PINSK MARSHES AND THE ROUTES TO KIEV. The great marshes of Western Russia are variously called Pripet, after the river which runs through but does not effectively drain them, and Pinsk, for the largest city included in their vast expanse. The term "vast" is not an exaggeration, for the marshes extend from Brest-Litovsk on the German-Russian border eastward to and beyond the Dnieper, a distance of more than 300 miles, and stretch from north to south more than 150 miles.

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*This paper is based chiefly on five articles published in the October 16, 23, 30, November 6 and 13, 1941, issues of the Illustrierte Beobachter. The source is believed to be reliable, but details in regard to the order of battle of the various task forces and in regard to the chronology of operations are unfortunately lacking.

The marshes had a marked influence on German strategy. Such roads and railroads as existed in them were not first-class. Moreover, a demolition which would be merely a nuisance on dry land would be disastrous in a region where any detour from a road-bed meant hopeless bogging down. Consequently, the marshes could not be effectively penetrated, and were thus a natural boundary between the two groups of armies.

From his concentration area, von Reichenau had to advance toward Kiev along the southern edge of the marshes. The axis of his advance was determined by the disposition of highways and railroads.

At Kowel, the railroad line from Biala and Brest-Litovsk joined the line from Chelm and Luboml. East of Kowel, the single line led to Kiev through the southern part of the marshes, across numerous tributaries of the Pripet River. From three of the villages on this railroad, branch lines ran north or northwest toward the Pripet River or the Dnieper (see map). This road and its branches were single-track, and the gauge was different from that of German railroads.

As with the railroads, a highway from Brest-Litovsk and a highway from Luboml met at Kowel, east of which a great highway led to Kiev. This highway was of asphalt and had four traffic lanes from the old Polish-Russian border to Kiev (according to some accounts, all the way from the new German-Russian border to Kiev). This road, which was south of and approximately parallel to the Kowel-Kiev railroad, led through well-drained country and cut across the Pripet tributaries in their upper courses.

VON REICHENAU ADVANCES AND BUDENNY RETREATS. Because of the difficulties inherent in the use of the Russian railroads, the Germans generally chose the highways for their spearheads in Russia -- in this instance, the excellent Kiev highway.

The men and materiel of von Reichenau's Sixth Army had apparently been concentrated as close as possible to the border, along all-weather roads. Some of the first units to enter Russia crossed the frontier near Brest-Litovsk and advanced along the highway from Brest-Litovsk to Kowel. Others, entering further south, advanced along the highway from Luboml toward Kowel. Like the other leading units, which literally rolled into Russia on the morning of June 22, 1941, the forward units of von Reichenau's army again used the spearhead tactics which had been so successfully employed in France and moved forward with great speed, protected by superior air strength. As the Germans advanced, the Russians retreated at an average rate of some 15 miles a day.

To the German commanders, as to observers outside the battle area, the parallel with the campaign in France must have appeared striking. In each case large areas of important territory were promptly occupied by the Germans.

The Russian withdrawal, however, was not due entirely to weakness. Beyond question, the Russians knew that the Germans had massed great quantities of men and materiel along good highways, just across the Bug. Uncertain

exactly when and exactly where these massed Nazi resources would be used, the Russians apparently held their forward positions with delaying forces only and elected to make their main defensive stand many miles to the east. In this way, the Russian commanders were able to learn the direction and strength of the German thrusts before committing the Russian reserves. Even in retreating, they could learn something of German tactics. Finally, when the main engagement would take place, German lines of communication would be long and Russian lines short. These considerations, as well as the strength of the Nazi military machine, probably played a part in the rapid Russian retreat before the German armies in the 1941 campaign. Nor was the German advance made without cost. Battered vehicles abandoned by the road, dead horses, and destroyed villages told of the fury of the Russian rearguard action.

FIGHTING BETWEEN A HIGHWAY AND A RAILROAD. Since von Kleist was on his right, von Reichenau appears to have had no difficulty on that flank as his spearhead advanced.

On the left (northern) flank, the situation was different. There was no ground contact with the nearest army of the Center Group; this army, in fact, was miles away, north of the Pripet marshes. Moreover, the Russians were in these marshes in considerable force and at once began to harass von Reichenau's left flank. Accurate and heavy Russian artillery barrages came down unexpectedly on German transport.

In spite of this harassment by Russian artillery, von Reichenau's forward troops continued to move ahead. The area taken by the spearhead troops extended not more than 2 or 3 miles on each side of the highway.

The situation on the marsh flank could not, however, be ignored. Resistance to the Russians was left to foot-infantry troops armed with the necessary heavy weapons and artillery. At every crossroad or junction, a task force had to be constituted to cope with a Russian attack which, if neglected, might threaten the flank. A German commentator, irked by the cost of the operations, stated that a full-scale battle had to be fought for each miserable village, which was worthless in the first instance and rubble when taken.

In the battles between the troops on the highway and those on the railroads, the Germans had the advantage. They were able to move forward more troops and material on the four-lane highway than the Russians could bring up on the single-track railroad, and a Russian retreat was forced. In no case, however, was the bulk of the Russians cut off. When outgunned by superior German artillery and in danger of being flanked by the advance on the highway, the Russian troops retreated along their railroad line to the next vantage-point and again harassed the German advance.

Shortly after the campaign began, the Germans were at Kowel, the junction of the railroad line which the Russians had determined to hold and the highway on which the Germans had determined to advance. After overcoming strong Russian resistance at Kowel, the Germans again moved forward, and took in

turn Luck, Rowne, and Zwaihel. Soon they were at Zhitomir, an important junction some 75 miles from Kiev.

After crossing several minor streams, their forward elements reached the heights west of the Irpen River. From the summit of this high ground they could see the spires of Kiev. They were 5 miles from the outskirts and 12 miles from the heart of the city. In 20 days they had come 312 miles. With Kiev in sight, an armored division hurried down the four-lane highway toward a wooden bridge over the Irpen.

CHECK OF THE SPEARHEAD AT THE IRPEN RIVER

THE GERMAN SPEARHEAD IS HALTED. Despite the unexpected and strong Russian assaults which had harassed their advance and were still continuing against their left flank well to the rear, the Germans claim they were confident on July 12 as they started down the western (left) bank of the north-flowing Irpen. Suddenly, in front of them, the wooden bridge of the great four-lane highway was blown out by Soviet troops. Germans often make light of Russian demolitions, but this one they conceded to be perfect. There was nothing left of the bridge, and the steep west banks were under Russian fire. The armored spearheads could not cross the Irpen, and had to retreat up the hill. The delay was annoying, but (according to German sources) it did not shake the confidence of men who had advanced 312 miles in 20 days.

For 20 days they had averaged 15 miles a day; in the next 2 months, however, they were not to move a yard!

The first difficulty was the terrain. Directly in front of the Germans was the Irpen River, a natural bastion of Kiev. Here in its middle course the Irpen had dry banks, but the channel was unfordable. There were many wooded areas on the slopes, particularly on the Russian-held eastern slope, and Russian troops in these woods commanded every yard of open space between the heights on the western bank and the river. Most of the cultivated land was in tall grain, under cover of which the Germans apparently constructed field fortifications. Suburban houses, which offered many opportunities for concealment, dotted both slopes, particularly the Russian-held eastern slope. The four-lane highway cut across the Irpen and ran straight up the hill through a wood toward Kiev, but the bridge was destroyed and every foot of the roadway was under Russian fire.

The Irpen position, moreover, could not be flanked by the German advance units which were halted there. To the north near the mouth of the Irpen, the terrain was swampy, and the Russians held the rail-line in menacing strength. To the south, the upper Irpen, which widened at places into lakes, was an obstacle; and across the divide between the Irpen and the Dnieper, the Weta and the Strugna Creeks were as well defended as the Irpen.

After von Reichenau's leading elements had been halted on the west bank of the Irpen, he immediately devoted himself to a three-fold task: the consolidation of the Irpen position; the elimination of the Russian artillery which was still

pounding his supply line and interfering with the bulk of the Sixth Army's movements to its new concentration area east of Zhitomir; and the protection of the Irpen position by operations on the Weta and the Strugna. The accomplishment of these tasks would have the dual result of preventing a successful Russian counterthrust and of establishing the Sixth Army in positions from which, under more favorable circumstances, a further advance might be made.

THE HALTED GERMANS DIG IN AND RECONNOITER. Von Reichenau's forward units were much over-extended. According to German claims, these units were some 125 miles ahead of the foot-infantry divisions of their army and now had to devote themselves to holding on until the infantry divisions could come forward.

A headquarters for the defending German troops was apparently established in the little village of Milaja, just west of the Irpen, and the main body of the forward troops occupied two shallow ravines more or less parallel with the river. Fox holes were dug at once to give shelter to the troops, who were tired by their rapid advance. Construction was carried out under extreme difficulties. Any movement beyond cover brought a storm of Russian artillery fire. Russian aviators flew over the German-held houses on the west bank every 2 hours at a height stated by the Germans to be only 35 to 50 feet, dropping 5-pound bombs and machine-gunning the German positions.

There is no reference in available sources to German air reconnaissance over the Irpen position, but such reconnaissance was routine in similar situations and doubtless took place here. Ground reconnaissance was constant. From hidden positions just east of the village of Milaja, officers with camouflaged BC scopes searched the eastern banks of the Irpen. Soon a bunker was discovered. Some hours later a second bunker was detected, and finally the general course of a line of bunkers. Further observation with field glasses led to the discovery of field positions and to the conjecture that there was a tank-trap ditch behind a stockade-type fence. Numerous trucks full of men and materiel were seen to turn off into the woods on both sides of the main highway from Kiev. The Russians were evidently strengthening their already well-defended position.

THE RUSSIANS COUNTERATTACK. In a few days the Adolph Hitler Regiment took over the position from the spearhead troops, and was later relieved by infantry at dawn on a date unknown but shortly after July 20.

But the Russian reconnaissance and intelligence had been effective. The Russians had learned precisely what was happening on the German side of the river and during the relief of units launched a strong artillery attack. During the afternoon, Russian combat patrols crossed the river on footbridges. Even though the slope on the German side of the river was level and open in comparison with the slope on the other side, Soviet advanced units, under cover of their artillery, succeeded in hiding themselves in small hollows and depressions.

At nightfall, a German battalion was ordered to regain the lost ground. On a front which extended about a mile and a half north and 2 miles south of the highway, the Germans attacked along a line about 500 yards west of and parallel to the Irpen. Under the cover afforded by fields of tall grain, they used machine guns, rifles, and hand grenades against the newly-won Russian positions under fire, however, from Russian mortars.

After a conflict which lasted about an hour and was especially violent along the highway near the blown-up bridge, the Russians were pushed back across the Irpen. The large searchlights, which the Soviets had camouflaged in the treetops, began to flare across the German-held west bank, sweeping the grain fields, and the Germans did not attempt to pursue the retreating Russians across the river. The infantrymen sought out their old fox holes east of Milaja, and an hour before dawn set up their machine guns again in the positions they had occupied before the Russians crossed the river.

THE SIXTH ARMY CONCENTRATES BEFORE KIEV. Meanwhile, screened by the troops who had repulsed the Russian counterattack on the Irpen, the rearward combat units of von Reichenau's Army continued to move forward rapidly to positions east of Zhitomir.

The one road to Kiev had to be used by almost the entire Sixth Army; it was therefore imperative that any possible jamming and confusion be avoided. Rather than depend entirely upon guides and messengers, the Germans made great use of directional signs. At each junction there were many road markers bearing unit insignia. The signs were especially elaborate at Kotscherowo, where units turned off to protect the southern flank of the Irpen position, and at the junction south of Makarov, where units turned off to secure the northern flank. With these route markers as guides, motor vehicles left the highways without a halt for task missions against the Russian railroad positions or to move into concentration areas. Serials were formed, according to the speed of vehicles or the time a small unit was ready for moving, and the markers with division insignia were relied on to bring the subordinate units together again.

Provision had to be made for servicing and supplying advanced units, and one lane (at least between Zhitomir and Kiev) was designated for west-bound traffic, with three lanes for eastward movement of men and materiel. Over the west-bound traffic lane, transport elements of the forward units went to Zhitomir each night on missions of servicing and supply.

To sum up, the Germans, in the days following July 13, made use of the great highway to strengthen their position on the Irpen, and bring forward troops in great quantities. Some of these relieved the soldiers on the Irpen. Some were thrown off on the left flank to continue the fight for the railroad. Some moved to the South to prevent the Irpen position from being outflanked. Most of them, however, were brought just east of Zhitomir into a staging area which was almost as large as the original concentration area between Biala and Chelm on the west bank of the Bug. Supplies were also brought forward in large quantities. From this new concentration area, troops and supplies were in a position to be

moved at the commander's will as operations developed.

OPERATIONS ON THE LEFT FLANK OF THE SIXTH ARMY

THE RUSSIANS CONTINUE TO THREATEN THE GERMAN LEFT FLANK While von Reichenau in the days following July 13 was strengthening his position on the Irpen and was bringing forward the bulk of the Sixth Army into its new concentration area east of Zhitomir, Russian artillery was still active on his north (left) flank. The Russians on the railroad had apparently not retreated further eastward than Korosten, and Russian artillery was now dangerously near to the new concentration area east of Zhitomir. Accordingly, von Reichenau determined to secure at any cost his exposed left flank, and launched a vigorous assault on the Russian position at Korosten. The railway junction here was defended by the Russians with bitter determination, and it fell into German hands only after hard fighting; again, the Russians retreated northwest and east along the railroad lines.

THE BATTLE FOR ANDREJEVKA. By July 23, the Germans had mopped up Korosten and other neighborhoods to the east, and now determined to take Andrejevka. Many details in regard to the struggle for this village are available and are believed to be typical.

For the Andrejevka engagement, German forward units apparently left the Zhitomir-Kiev highway at the junction near Makarov. During the night of July 22-23, several artillery battalions and a smoke battalion moved up under cover of darkness, and took their positions less than three-quarters of a mile from the infantry front line. At 0430, light and heavy field howitzers, 100-mm guns and 180-mm mortars opened fire against the Soviet field fortifications which German observers had detected on the southern edge of Andrejevka. At the same time, German smoke shells fell among the Russian field positions and spread a thick veil of smoke just in front of the village.

The heavy fire preparation, the laying of the smoke screen, and the beginning of the infantry advance had been coordinated. The Russians were blinded; neither their forward infantrymen nor their observers in observation posts could see more than five or six yards through the thick smoke. Unobserved, the German infantrymen left their positions of readiness and rushed across the open terrain toward Andrejevka, whole infantry companies reaching the edge of the village with hardly the loss of a man. The Russians were unable to check the German advance with their heavy weapons, because their firing was based on data obtained before the laying of the smoke screen.

The smoke screen had been launched under ideal weather conditions and remained for a long time.

As soon as the Soviet observers could see through the gradually disappearing smoke, they directed fire against the German attacking infantry. However, the German forward artillery observers quickly informed their batteries of the location of the Soviet artillery and heavy weapons positions. These

positions were at once shelled heavily, and soon became silent.

The German infantrymen then entered Andrejevka, which consisted of many field positions, all excellently camouflaged and all liberally provided with machine guns and mortars. Houses and barns had been equipped for defense. The Russian positions were in many cases connected by cleverly arranged trench systems.

THE THREAT TO THE LEFT FLANK IS REMOVED. The engagement at Andrejevka was basically a struggle for the Korosten-Kiev railway line, which passed a mile or two to the north. With the German capture of this village, following the capture of Korosten and Malin, this vital railroad, except for a short suburban portion near Kiev, was in German hands. The Russians who had threatened von Reichenau's left flank withdrew now to assist in the defense of Kiev. No information is available as to their line of retreat; but most of them probably fell back along the railroad to the strongly held position east of the Irpen. The new Russian front line north of the Zhitomir-Kiev highway became something like the top half of the letter "C".

Overcoming the Russian resistance along the railroad reduced the threat of a Russian flank attack from the north. Few roads and railways led through the Pripet marshes toward the new German positions, and the Germans instead of the Russians were now aided by the fact that a slight demolition could render a whole area impassable.

Von Reichenau had not only secured his left flank; he was also getting into position to make contact (previously denied him by the Pripet marshes) with von Bock, whose Second Army and Second Armored Army were soon to move down from the north.

OPERATIONS ON THE RIGHT OF THE SIXTH ARMY

A CORPS MOVES TO SUPPORT THE RIGHT FLANK. While elements on the northern flank of von Reichenau's army were attacking Russian positions on the railroad north of the Zhitomir-Kiev highway, one of his corps was assigned a mission to the south. The mission of this corps was not only to assist in securing the Irpen position but to put von Reichenau's army into areas from which an assault upon Kiev could be made when the situation permitted.

The German units destined to take part in the large-scale operations south of the Irpen position turned off the main Zhitomir-Kiev highway at Kotscherowo, and proceeded in a southeasterly direction by way of Brusilov to Fastov. German panzer and motorized infantry divisions went first along the paved road, which stopped at Fastov, some 40 miles southwest of Kiev. Beyond Fastov, the troops had to advance toward their new positions along ordinary roads, which had been turned into mud by a three-day rain.

On a front of some 12 miles running from southeast to northwest astride the Fastov-Vasilkov-Kiev road, five infantry divisions were moved up to

establish prepared assembly areas from which an attack was to be made later against Kiev. Fastov was the center of combat for the entire sector, since it was on the only practical road to Vasilkov, the one city of any size between Fastov and Kiev. There were regimental assembly areas on each side of this road.

Two villages, Gelenovka on the left and Marjanovka on the right, flanked the roadway some distance in front of these assembly areas, and as the Germans approached these villages they encountered difficult terrain, for the Strugna had many tributary creeks with steep slopes. The two villages had, moreover, been very heavily fortified by the Russians, and here again, as north of the Zhitomir-Kiev highway, the Germans were compelled to use their heavy weapons and expend themselves in force against unimportant localities which the Russians had transformed into fortresses.

THE GERMANS USE DIVE BOMBERS AND TANKS IN CAPTURING THE VILLAGE OF GELENOVKA. The German heavy artillery had been moved into position, apparently south of Fastov, and by July 30 von Reichenau felt that his southern corps was ready to launch an attack toward Kiev. The attack was made at 0400 on a 12-mile front. Artillery concentrations fell on Gelenovka and Marjanovka--and at the same instant similarly heavy Russian artillery attacks were directed upon the German positions. The Germans learned later from prisoners that the Russians had, by an unusual coincidence, made their plans for an attack upon the German positions at this same hour.

Under the cover of fire by their artillery, German infantry troops moved into positions of readiness at the bottom of the small valley in front of Gelenovka. During this movement, they were under fire from Russian artillery.

Either by previous plan or because of the unexpectedly heavy Russian artillery fire, the Germans sent in eight dive bombers at 0530. The German and the Russian artillery fire ceased as the planes appeared. These dive bombers released their bombs at an altitude of about 450 feet. A decrease in Russian fire indicated that Soviet observation posts and guns had been hit by the bombs.

The advancing German infantry, however, had to cross broad fields of ripe grain before arriving at the edge of the village. In accordance with their customary tactics, the Soviets had taken advantage of the cover afforded by the grain and, digging deeply into the black soil, had constructed an elaborate system of field positions to protect the village. Russian machine-gun fire from flanking positions, as well as carelessly directed German infantry fire, increased the difficulties of the forward German units as they moved through the grain fields. There was heavy hand-to-hand fighting for the Soviet machine-gun and rifle nests. Finally, the leading German units reached the edge of Gelenovka. There again machine guns, rifles, and hand grenades were used on both sides in close combat in front of the village.

In spite of bitter and incessant fighting from 0400, Gelenovka was still held by the Russians shortly before sunset. At this time, German armored assault artillery advanced through lanes among the halted forward elements and

charged into the village, firing in every direction from which resistance appeared. Riflemen followed closely and beat down any resistance not broken by the assault artillery. At sunset Gelenovka was finally captured. The exhausted infantry sat at the side of the road amid dead Soviet soldiers, crushed horses, and burned vehicles and watched a stream of Russian prisoners led to the rear.

According to German sources, an equally severe struggle was necessary to secure possession of other villages, including Marjanovka. When Marjanovka was taken, the Germans felt that they had entered the outer protective ring of the positions in front of Kiev.

THE GERMANS ARE STOPPED AT WETA CREEK BY RUSSIAN DEPLOYMENT IN DEPTH. On July 31, German troops worked forward from Marjanovka toward Vasilkov, the only city on the road to Kiev from the south. German observers with glasses sought for any possible show of hostile resistance in the tall grain. Infantrymen combed the grain fields and the steep slopes of the Strugna tributaries.

The Russians harassed the German advance by artillery fire; however, they evacuated the inhabitants of Vasilkov, and did not defend that city. The Germans entered the town, established headquarters, and dug in around the outskirts to protect the units and supplies which were brought up.

During the forenoon of August 1, the leading German elements continued beyond Vasilkov in close pursuit of the Russians. After passing through several villages and crossing several swamps, the Germans, encountering increased opposition, approached the Weta, which the Russians had determined to hold. Russian artillery and mortar shelling of the German forward positions was extremely heavy on August 1, 2, and 3.

In front of the Germans and across the Weta, the Russians had constructed a semicircular line of bunkers similar to those further north along the Irpen River. The Germans at once began efforts to force these positions. At dawn on August 3, a young lieutenant succeeded in leading his platoon into the valley through a ravine obscured from the enemy. The platoon crossed the Weta and surprised a hostile security group located behind wire obstructions and an antitank ditch. Although accurate Russian shellfire prevented this platoon from holding its position, the observations reported by the lieutenant formed the basis for his battalion commander's attack. During the evening of August 3, German heavy weapons units, varying from heavy mortars to light field howitzers, completed their movement into positions in front of the Weta bunkers. Fire began at once, and hits were registered on positions located by observers in advance posts.

On August 4 at 0400, German artillery opened a heavy concentration of fire against Russian fortifications in the woods across the Weta. Three Russian bunkers received direct hits. After 45 minutes of continuous firing, there was a lull of five minutes, and at 0450 the German shelling was renewed with increased intensity. Smoke mortars next went into action; their shells exploded in front

of and between enemy bunkers, and covered the center of the valley with a smoke cloud. Artillery fire was continued. The commander of a German infantry battalion leaped out of his cover, led his companies down the slope, through the knee-deep Weta, and across a 70-yard open space to a lane cut through the wire entanglements by the bridgehead platoon. Fortunately for the Germans, the bunker which protected the antitank ditch just beyond the wire had been put out of action by a mortar.

After crossing the antitank ditch, the right flank rifle company encountered another band of wire entanglements. Pioneers rushed to the front and cut a lane, through which a second special group of pioneers moved against the bunker on the right, bursting it open with two concentrated explosive charges. Then the flame throwers squirted their liquid fire into the hatchways, and a black smoke cloud obscured the view for some minutes. The Germans pushed on into the forest and found numerous abandoned field positions dug deeply into the earth. Their artillery fire had destroyed Russian resistance in that particular area. In places, the forest was a jumble of giant craters, broken trees, and torn branches. The air was full of dust mingled with the smell of exploded shells. A rolling barrage of German artillery, directed by observers with the leading elements, lifted just ahead of the Germans advancing through the forest. Finally the Russians were pushed out of their last positions in this area, which was over 100 yards inside the forest and a little more than a mile from the creek.

Simultaneously, other Russian bunker positions were penetrated, not only here, but on the front of the entire corps attacking on the south. The Russian fortifications were arranged in great depth, however, and this corps, while it had scored minor gains, could not effect a break-through.

Under heavy Russian fire the German riflemen lay on either side of the road in deep trenches which protected them from hostile shell splinters. They were surrounded by ankle-deep mud, and stretched pieces of canvas over themselves for shelters. They did not shave or wash for days. The field kitchens were several miles in the rear, and by the time meals could be served the food was cold. But, in spite of difficulties, the Germans held their position in spite of strong Russian counterattacks. They thought, according to their own accounts, that they would reach Kiev in 2 or 3 days. However, they remained in their positions, 12 miles from the heart of the city, and for a number of weeks made no advance against the determined Soviet resistance.

In the meantime the Germans strengthened their positions, turned Vasilkov into a headquarters town, and brought up supplies and reinforcements again by an all-out attack, which made no appreciable headway.

VON REICHENAU'S HALTED ARMY BECOMES THE HOLDING ATTACK OF THE KIEV ENCIRCLEMENT OPERATION

The situation before Kiev was finally resolved in September by events many miles away, both south and north. In the south, von Stuelpnegel had thrown a bridge across the river below Kremenchug, (see Tactical and Technical Trends

No. 7 p. 40), and still nearer German forces had established bridgeheads across the Dnieper at Kanev, Rjishchev, and Tripole. Thus the west bank of the lower Dnieper was in German hands.

In the north, von Kleist had crossed the Desna near Novgorod-Seversky. Also, on the northern flank, a German advance to the northeast had forced the Russians out of Garnostaipol and across the Dnieper. The more northern elements of von Reichenau's Army had also established connection with von Weichs's army which had advanced north of the Pripet marshes, and had turned southward and crossed the Desna.

If the Germans had planned to take Kiev by a frontal attack, they had failed. Von Reichenau's army in two months of effort made no appreciable headway on the Irpen and on the Weta. The Germans had, however, dug themselves in so that they could not be easily thrown back. Whether the Germans had planned to take Kiev and had failed, or whether they had planned merely to secure strong positions before that city, they were now ready to become the holding attack in the envelopment which followed.

On September 17 at 0630 von Reichenau, once more began his attack on the Russian positions. As usual, violent artillery bombardment, assisted by dive bombers, paved the way for assaults with mortars, machine guns, hand grenades, and other weapons. The Russians again defended villages so stubbornly that each village outside of Kiev was destroyed. Because of the closing of the trap by armored troops far to the east of Kiev, however, the Russians had to cease their resistance, and withdraw across the Dnieper River. The city was captured by the Germans on September 19. Despite their heroic 10 weeks of resistance to the Germans in front of Kiev, the outflanking operations of von Bock from the north and of von Rundstedt from the south had forced the Kiev defenders into a disastrous position. The Russian soldiers who had fought so valiantly were withdrawn across the Dnieper, but were not able to escape from the trap which closed around at least four and possibly five of Budenny's armies.

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All correspondence pertaining to the bulletin should be addressed to the Dissemination Group, M.I.S.

Other publications of the Military Intelligence Service include:

Intelligence Bulletin, published monthly.

Special Series, published at least once a month, of which "The German Motorized Infantry Regiment" and "The Development of German Defensive Tactics in Cyrenaica--1941" are the most recent.

Campaign Studies, the most recent being "The German Campaign in Norway."

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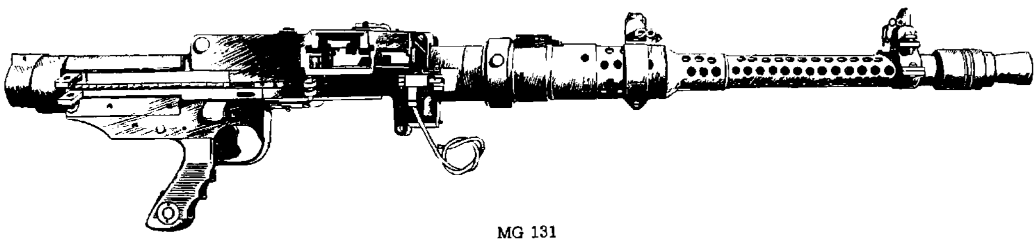
SECTION I

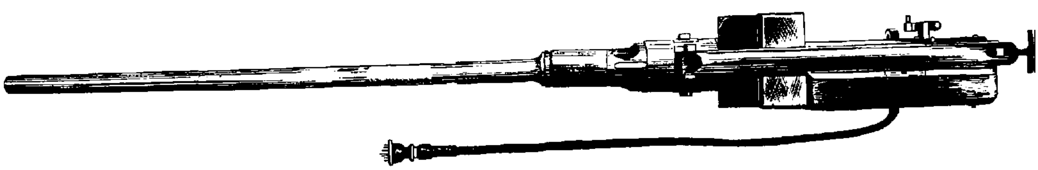
1. GERMAN AIRCRAFT CANNONS

There have been few radical innovations in the design of German small- or rifle-caliber machine guns, since these were developed to a high degree of efficiency before the war. Extensive changes, however, have been made in the design of some of the larger-caliber aircraft guns. While the 15-mm and the 20-mm types are still standard aircraft cannon, the Luftwaffe has brought into limited operational use a 30-mm cannon. It is anticipated that this may be used on late-model planes in the near future.

The MG-131 manufactured by Rheinmetal Borsig and the 151 patented by Mauser are among the most interesting developments in German medium-caliber armament. The accompanying sketches illustrate these types. These are commonly called machine guns because of their high rate of fire.



MG 131



MG 151

a. The MG-131

The MG-131 is a 13-mm air-cooled, recoil-operated gun, the ammunition being fed in a disintegrating metal, open-sided link belt, which is both light and flexible. This gun is distinctive in that the cartridges are detonated electrically. The current is broken when the gun is pointed toward the tail, wings, etc., and reestablished when the gun is aimed in the clear. This compact, light gun is of excellent workmanship and has a bore large enough to make possible the design of efficient AP and HE ammunition. The theoretical rate of fire is approximately 900 rounds per minute.

b. The MG-151

The MG-151 types (15-mm and 20-mm), found both in fixed and turret mountings, are notable for the simplicity of their mechanism and their high rate of fire. Although they are cocked and fired electrically, provision is made for hand cocking for servicing purposes and in emergencies. Ammunition for these guns is carried in a disintegrating metal belt similar to that used on the MG-131. A small electric lamp on the control board automatically lights when the gun is cocked, and indicates that it is ready to fire. For the 15-mm model the theoretical rate of fire is about 740 rounds per minute for AP, and 680 rounds per minute for HE. Rates for the 20-mm version are: AP, 800 rpm ; HE, 750 rpm.

2. THE GERMAN RESCUE BUOY

The Germans have developed de luxe buoys for flyers of the Luftwaffe brought down while operating over the English Channel. The Rettungsboje was constructed under the direction of the German Ministry of Air Navigation in 1941 at the suggestion of Generaloberst Ernest Udet. These buoys, called Generalluftzeugmeister after their sponsor, are anchored far offshore. They have saved many German airmen that ships or coastal planes might have been too late to rescue.

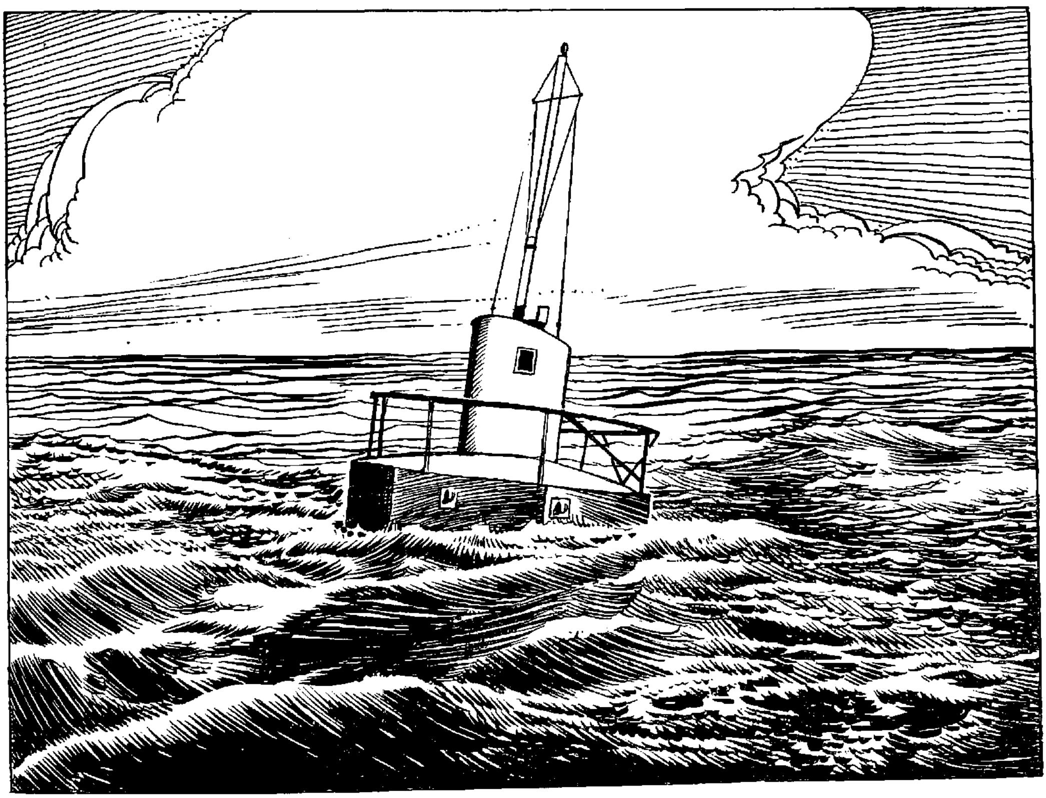
The buoys are of square or hexagonal construction and have a floor space of about 43 square feet with an 8-foot cabin rising above the float. On the upper deck of this cabin, there is an oval turret 6 feet high with a signal mast carrying a wireless antenna. Tube railings to which the distressed flyers may cling run along the outer circumference below and above the water line. A ladder leads up to the turret, in which there is a door opening into the cabin below.

A 320-foot red and yellow striped rope anchors the buoy at a fixed location, but allows a limited drift, thereby indicating the direction of the current to aircraft in distress. The buoy is painted light yellow above the water line, and red crosses against white oval backgrounds are painted on each side of the turret

The cabin accommodates four persons comfortably for several days, and in an emergency, the crews of several aircraft can be taken care of. It is electrically lighted by storage batteries, but in case of a breakdown kerosene lamps or other lighting devices are provided. There are two double-deck beds and adequate cupboard space for first-aid equipment, dry clothing and shoes, emergency rations, and a water supply. Hot food may be prepared on an alcohol stove. Cognac to relieve chill and cigarettes to quiet the nerves are also provided. Games, stationery, playing cards, etc. afford diversion until rescue is effected. Depleted supplies are always immediately replaced upon the arrival of the rescue ship.

A tubular lifeboat is available for transferring the downed aviators from the buoy to the ship.

Signalling is accomplished by hoisting a black anchor ball and a yellow and red striped flag on the mast during the day. At night, red and white lights in the turret indicate that rescued men are on board. A white anchor light on the mast is visible for 3,000 feet or more. SOS signals giving the location of the buoy are automatically sent out by an emergency wireless transmitter. Signal pistols with red and white lights, white-light parachute flares, or a smoke, distress-signalling apparatus complete the signalling equipment. Other equipment includes plugs to stop up bullet holes in the walls of the cabin and a pump for the expulsion of seepage. The accompanying sketches illustrate these buoys.



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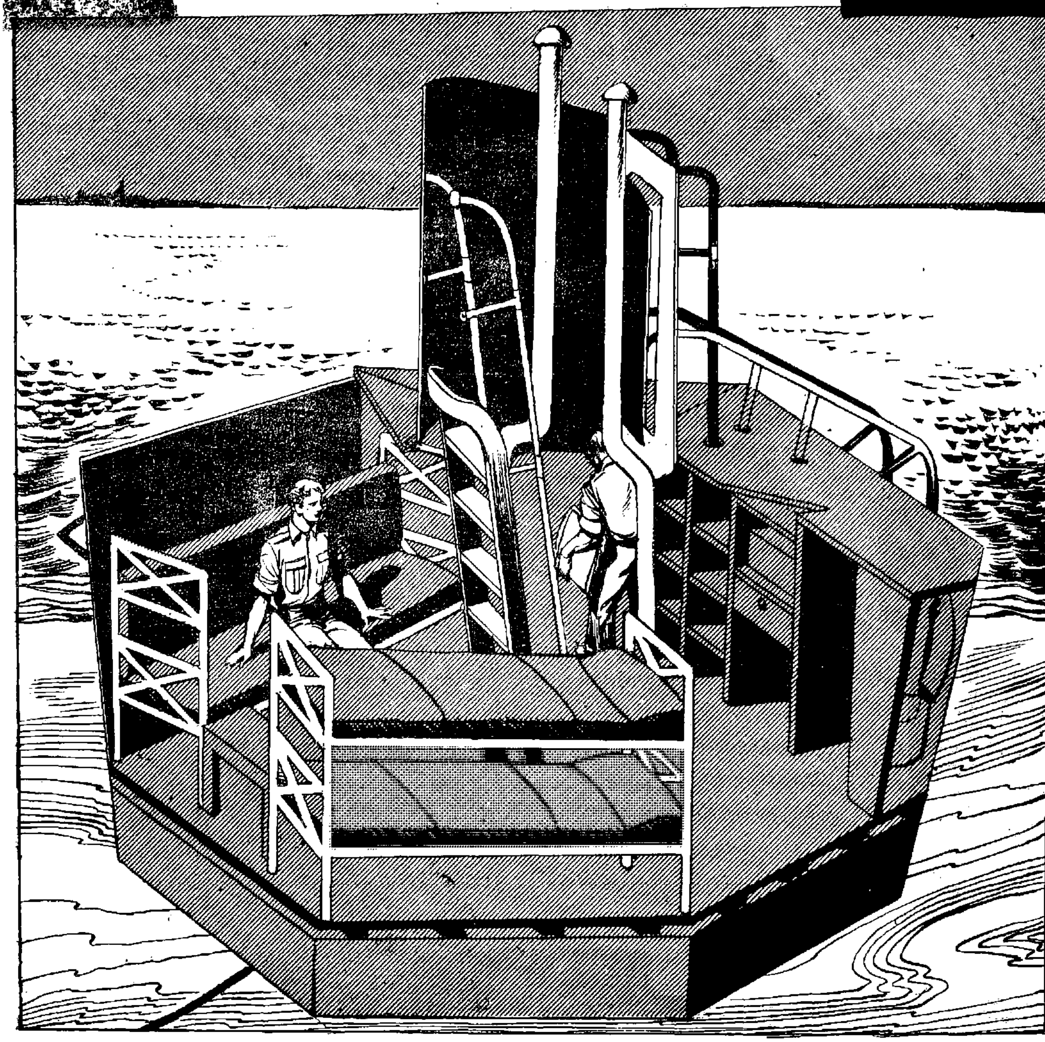


ANTIAIRCRAFT

3. ANTIAIRCRAFT DEFENSE OF MOTOR COLUMNS ON THE MARCH

The following is an extract from a Russian publication on the organizatio of antiaircraft defense of motor columns on the march.

* * *

Enemy reconnaissance is maintained by scout plane patrols approximately 20 to 35 miles from the advance elements and by timely establishment of stationary posts of air observation along the route of march. The stationary posts are provided with radio and other means of communication.

Air observation details are usually attached to the security detachments of the motor column.

In order to cover the movement of the motor column, pursuit aviation is

used either en route or at specific points, such as crossings and in defiles.

Pursuit aviation covers the motor column,patrolling at different altitudes over the region of its movement. Under conditions in which enemy raids are imminent and the information service is reliably organized, it is sometimes possible to place pursuit aviation in ambush near the route of the motor column.

One squadron of pursuit planes is capable of covering parallel columns along several roads on a front of 10 to 14 miles. If the front of the movement is wider, it is best to echelon the motor columns, allotting the pursuit aviation to one and additional antiaircraft artillery to the other.

Antiaircraft artillery is assigned to cover troops and motor transport along their entire route. If there is insufficient antiaircraft artillery, it is placed on sectors of the road most vulnerable to air assault, i.e., open terrain, crossings, or defiles. The batteries must be prepared for action and ready to open fire the moment the motor columns arrive.

Antiaircraft and heavy machine guns are used for covering troop motor columns against attack planes, dive-bombers, and scout planes of the enemy.

The distribution of antiaircraft machine guns is such that the whole motor column may be covered by their fire. These machine guns mounted in trucks move in the motor column at a distance of 1,200 to 1,800 feet from each other, always ready to open fire.

In transporting troops, motorized antiaircraft units manned by troops of the column, are used for air defense. Taking into consideration that many such units may be necessary, antiaircraft defense is organized along the march route as economically as possible.

If gas is sprayed from low altitudes, the motor column must leave the poisoned area and halt. In such cases, the drivers take measures to conceal their vehicles and then conduct a preliminary decontamination of the materiel and cargo. In case of heavy contamination of the vehicle surfaces, the canvas covering and the cargo must be taken off immediately and left on the side of the road, and the cargo covered with a new tarpaulin.

Large forests on the march route may be subjected to contamination prior to the time the motor column reaches them. Drops of the gas remain on the branches of the trees and get on the surface of the vehicles.

When contaminated forests are discovered, the march route is altered or the column stopped until decontamination of the sector has been effected.

As a rule, aviation contaminates forest roads from low altitudes, and consequently roads located one-half or one mile to the side of the contaminated area are usually not affected. These alternate roads are less convenient, but they often save time and effort otherwise employed in decontamination.

Dust from a motor column moving in a contaminated area is full of minute drops of gas. These drops, together with the dust, are carried in the air and are capable of producing casualties. Therefore, for the protection of personnel against gas, in addition to putting on gas masks, the windows of the cabs must be shut tightly and the distance between the vehicles must be maintained at 30 to 40 yards. For 2 miles after passing the contaminated area, the increased interval must be maintained.

4. JAPANESE ANTIAIRCRAFT GUNS

The following is a preliminary report based on recent examination of captured Japanese antiaircraft artillery weapons.

* * *

a. 75-mm AA Guns

The Japanese had three AA gun batteries of four guns each emplaced around their flying field and installations. They were placed in a generally triangular formation about 4,500 yards on a side. These guns were 75-mm on navy pedestal mounts. They have 360° traverse and 75° elevation. They fire HE shell with 30-second mechanical time and percussion fuzes.

There were no directors. At each position there was a 68-inch base coincidence range finder, navy type. Each gun has two telescopic sights mounted one on each side, with traversing handwheel on the right and elevating handwheel on the left. Lateral deflection, vertical deflection, slant range, and superelevation are all set on the series of drums, disks, and dials on the left side of the mount. The lateral deflection drum turns on a spiral and the scale is graduated from 0 to 200. The slant-range drum has two scales; the outer scale is graduated from 0 to 7,000; the inner scale has a graduation of 100 opposite the 0 on the outer scale, and 300 opposite 6,000 on the outer scale. This range drum is rotated by a small handwheel. Inside the range drum is a disk which is rotated by another small handwheel which also moves a pointer laterally as the disk rotates. On the disk, covering about 1/6th of the surface, are curves graduated from 500 to 5,000 in units of 500, believed to be superelevation curves. All of this moves both lateral and vertical sights as the drums and disk move. In addition there is what appears to be an open sight mounted on a drum. This drum is graduated from 0 to 100 in each direction. The handwheel which turns this drum elevates or depresses the vertical sight only.

There was no fuze setter such as ours. There were two hand tools, one similar to a pair of long pliers with tits on each end which fit in the two slots on the bottom ring of the fuze, below the graduations. The other tool was shaped like a truncated cone, with handles on each side. It had a slot in one side which fits over the lug protruding from the side of the fuze. The fuze was set by holding with the first tool and rotating the second. It is not clear where the fuze

setting was obtained. It may be from the inner scale on the range drum which was graduated from 100 to 300. No charts were found which would seem to be used for obtaining fuze setting.

b. AA Machine Gun, Caliber .50

Near the gun position on the beach was a Japanese machine gun, caliber .50, air-cooled and gas-operated. It was fed by semicircular clips holding 30 rounds each. Both ball and tracer ammunition was found. The machine gun had a forward area sight, oval in shape, about 5 inches across by 3 inches high, with a small oval in the center about 1 inch across by 0.6 inch high. The vertical and lateral wires in this sight went all the way across, while the diagonal wires on each side went only from the outer to the inner oval. The rear sight was a small vertical rod with a ball tip.

c. 25-mm Gun

In a separate position along the beach was a pompom, about 25-mm* with three barrels. This was the newest and most modern AA equipment seen. The sighting system was on the same general principles as that of the 75-mm guns. There were two telescopic sights, one on each side. All other sighting equipment was on the left side. Lateral and vertical deflection are set on a kind of hemisphere. The lateral handwheel rotates the hemisphere; graduations around the lower edge are from 0 to 180 in each direction. There is a slot about 1/2 inch wide up one side, across the top, and down to the other side of the hemisphere; in this slot, a kind of streamlined, elongated bird sight slides. The slot is graduated from 0 at the top to 50 on each side. Time did not permit a thorough examination of this sighting equipment, so that it is not thoroughly understood. Range is set by either of two handwheels. One rotates a drum with scale graduated from 500 to 3,800 in red numerals. The other rotates a drum with scale graduated from 0 to 3,800 in blue numerals. The guns are fed by clips which hold about 15 or 20 rounds AP and tracer.

In operations against the Japanese in this theater, our fighters have reported accurate AA gun fire up to about 12,000 ft. A hurried study of this 75-mm AA gun equipment would seem to indicate that this is about the limit of accurate fire with this equipment. Captured Japanese aviators have expressed wonder and admiration of the accurate high-altitude AA gunfire of the Americans. One 90-mm AA gun battery shot down a Japanese bomber at 27,400 feet altitude.

* Although reported as about 25-mm, it is possible that the gun is a standard Japanese 20-mm.

5. ITALIAN 90-MM MULTIPURPOSE GUN

Shortly before the beginning of the last British offensive in Egypt, the Italians put into service a 90-mm multipurpose gun, whose muzzle velocity, range, and weight were given in the summary of Italian weapons in Tactical and Technical Trends, No. 11, p. 45. It is now known that the length of bore is 53 calibers rather than 50, and that the practical rate of fire is 15 to 20 rounds per minute.

The gun has a steel monobloc barrel with a detachable breech ring, allowing the barrel to be changed. The weight in action is given as 11,220 pounds.

Normally, the gun is tractor-drawn on a four-wheeled Lancia Ro trailer, although a self-propelled model, utilizing a standard Italian tank chassis, has also been reported. In the case of the latter model, the tracks of the tank are apparently locked before the gun opens fire.

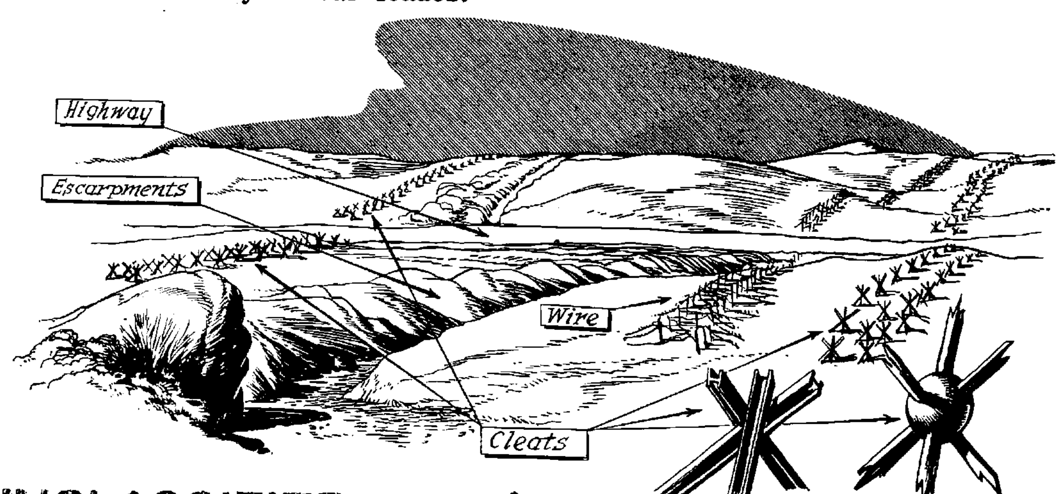
Since the characteristics of this gun are similar to those of the German 88-mm weapon, a correspondingly similar tactical employment may also be expected.

6. SOVIET ANTITANK DEFENSE

The following observations and sketches on passive Soviet antitank defenses were made by U.S. Military Attaches after a visit to the Gzhatsk-Vyazma front during the latter part of June 1942.

* * *

On every possible defensive position the Soviets have constructed barriers, barbed-wire barricades, escarpments, tank traps, and tri-railed cleats. All of these obstacles are supported by fortified dugouts and pillboxes of various sizes, so placed as to cover the approaches of the enemy units, which would be canalized by the barricades.



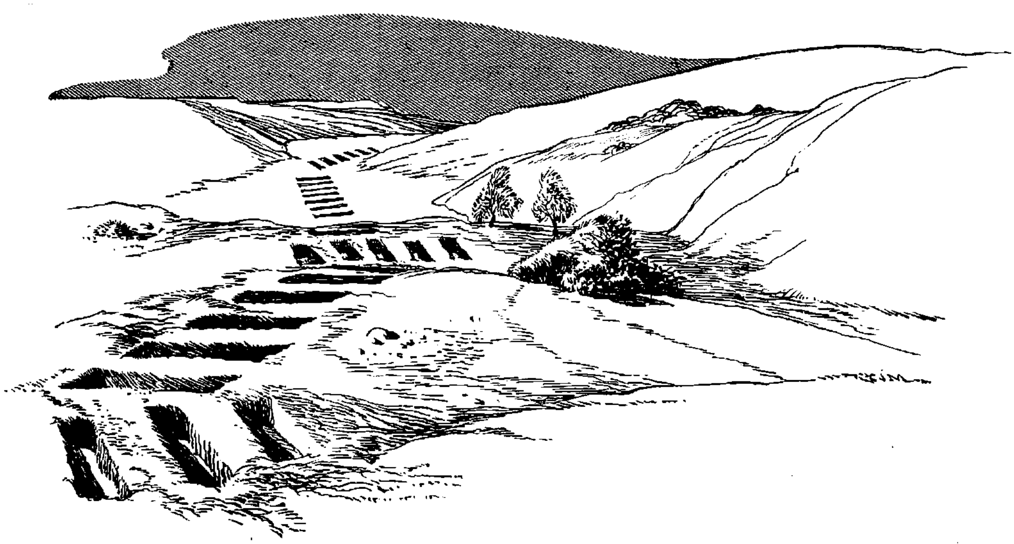
The main antitank escarpment extends perpendicularly from the road, either 200 to 300 yards out, or to a secure flank such as a woods or swamp. The ditch usually follows the contour of the terrain and is normally located on a forward slope so that the rear wall rises far above the front wall. The rear (Soviet) bank of a stream affords an excellent site for an escarpment. Escarpments are dug as nearly level as possible so as to retain water from the snows, rains, or swamps. Dirt excavated from the ditch is thrown to the rear ramp. The escarpment usually is dug about 10 feet deep and about 20 feet wide.

In front of the escarpment is usually placed a barbed-wire barricade of the same length and about 3 feet high and 10 feet wide. This wire is designed principally to keep enemy infantry from utilizing the escarpment as a trench.

The Soviets construct single or multiple rows of tri-railed or 6-inch steel I beams, or 3- to 4-inch pipes welded or bolted together and, depending on the terrain, place them in front or in the rear of escarpments, or sometimes in isolated positions. The advantage of this type of barricade is that it can be prefabricated in the rear and brought up and merely dumped into position.

Rows of posts in checkerboard fashion, 3 feet high and 10 feet wide, strengthen the system. In some areas entire groves of trees were cut down and cleared away, leaving only 3-foot stumps.

Another type of antitank obstacle (shown in sketch below) consisted of parallel ditches about 3 feet deep, 3 feet wide, and 30 feet long, and so spaced as to deny tanks sufficient clearance. Groups of such ditches would be placed at varying angles to neighboring groups, their purpose being to cause tanks to become hung on the edges.



Antitank obstacles and ditches are constructed under the supervision of engineers, but troops of the communication zone and civilians are used to do the

digging.. There is no special equipment for digging, and it is all by hand.

7. ARMOR PENETRATION OF GERMAN ANTITANK GUNS

a. General

The following figures show the armor-piercing capabilities of the three standard German antitank guns, the 37-mm, the 50-mm, and the 88-mm, as well as of the new long-barreled 75-mm gun which is now replacing the old short-barreled 75-mm gun on the Mark IV tank and the Sturmgeschütz (self-propelled assault artillery). These figures are based on performance of an AP projectile against homogenous armor, and supersede previously published information in *Tactical and Technical Trends*.

b. 37-mm Antitank Gun

Range (yards)	Penetration of Normal AP Projectile (inches) (at 90°)	(at 60°)
0	2.42	1.85
250	2.17	1.63
500	1.87	1.44
750	1.67	1.24
1,000	1.44	1.06
1,250	1.26	.91
1,500	1.10	.81

Range (yards)	Penetration of Special AP 40 Projectile (inches) (at 90°)	(at 60°)
0	3.43	2.93
100	3.13	2.68
200	2.83	2.42
300	2.58	2.19
400	2.30	1.95

c. 50-mm Antitank Gun

(The new 50-mm gun in the Mark III tank has approximately the same characteristics.)

Range (yards)	Penetration (inches) (at 90°)	Penetration (inches) (at 60°)
0	3.43	2.91
250	3.27	2.76
500	3.07	2.56
750	2.87	2.36
1,000	2.64	2.20
1,250	2.44	2.01
1,500	2.24	1.85

d. 88-mm Antiaircraft-Antitank Gun

Range (yards)	Penetration (inches) (at 90°)	Penetration (inches) (at 60°)
1,000	4.72	4.21
1,500	4.17	3.66
2,000	3.66	3.15

e. New Long-Barreled 75-mm Gun in Mark IV Tank and Sturmgeschütz

Range (yards)	Penetration (inches) (at 90°)	Penetration (inches) (at 60°)
0	4.72	3.86
500	4.25	3.50
1,000	3.82	3.11
1,500	3.43	2.76
2,000	3.03	2.44

The length of the gun is given as 43 calibers.

 [redacted]

8. ADDITIONAL INFORMATION ON THE GERMAN SCHWERE WURFGERAT 40

Tactical and Technical Trends, No. 8, p. 28, contained preliminary information on this new type of German bomb-thrower. Additional material from Russia includes the following details:

The HE projectile, which weighs 181 pounds, has a diameter of 11 inches and a maximum range of 2,088 yards, while the incendiary projectile has a diameter of 12 inches and a maximum range of 2,200 yards. The burst of the incendiary projectile is effective over an area of approximately 75 feet by 45 feet, and the burning petroleum in this area is reported to ignite any inflammable material to a height of 8 or 10 feet above the ground.

The Model 40 Wurfgerät is fired from a stationary mount, with 4 projectors to a mount. These mounts are normally arranged either in line or in checkerboard formation. The minimum distance between mounts is 6 feet, and between rows of mounts, 15 feet. Behind each row of mounts a strip about a yard wide is cleared of vegetation to prevent a possible fire caused by the rocket propulsion system.

The ignition of the projectiles is so arranged as to secure a 2-second interval between rounds. When the mounts are arranged in a series of rows, the last row is fired first.

Since fire is relatively inaccurate, there is a large zone of dispersion, making the weapon useful only for area firing.

Comment: This rectangular pattern of burst may be due to the fact that the projectile, with its blunt nose, does not penetrate, but bounces forward for several yards after impact, giving a pattern of burst which is longer than it is wide.

9. GERMAN 105-MM GUN

A recent report on the German 105-mm gun, called the 10-cm Kanone 18, gives some details not included in the summary of German weapons in Tactical and Technical Trends, No. 9, p. 46. This gun is a standard medium artillery piece, and the split-trail carriage is the same as that used with another German medium artillery weapon, the 150-mm howitzer. It may be either horse-drawn or split into two loads and motor-drawn.

Other characteristics are as follows:

Rate of fire	6 rpm
Length of bore	40 cals
Weight in action	11,220 lbs
Elevation	-3° to $+50^{\circ}$
Traverse	60°
Weight of HE shell	33 1/2 lbs

The ballistic characteristics for the HE shell are given in the following table:

Charge	Maximum Range (yds)	Time of Flight (secs)	50% Zone (yds) Length	Breadth
Small	13,800	52	106	17
Medium	17,200	62	117	20
Large	20,600	70	128	22

The figure 208 was originally reported for the "50%, zone, length, large charge," but 128 has been substituted as being more probable.

10. 305-MM SKODA COAST DEFENSE GUN L/50

The particulars and general description of the Skoda 305-mm CD gun L/50 have been received and are presented here for general information.

The 305-mm CD gun is constructed to meet all modern coast defense requirements. There are three particulars in which this gun is outstanding.

(a) It is long range and very accurate.

(b) The turret has a wide traversing arc, easily and speedily controlled by a specially constructed, electrically operated traversing gear, and hydraulic universal transmission. By means of this apparatus, the revolving speed of the turret is easily controlled, and the movement of a target can be accurately followed even at the longest ranges by using the hand-control wheel of the traversing gear.

(c) The elevating gear is likewise operated by an electric motor and universal transmission, giving easy and rapid control at long range. Again, a moving target can be accurately followed and covered by using the hand-control wheel.

The movement of the barrel into the loading position and back again takes place at high speed. This, in addition to the rapid feeding, loading, and firing devices, insures a very high rate of fire.

The gun is mounted in a revolving turret, which rests on the revolving half of a ball-race and is supported by a circular, walled platform. The fixed lower half of the race rests on an anchor ring bolted to the concrete bed. Between the armored wall of the support platform and the inner side of the surrounding concrete wall, there is a gallery in which runs the turret ammunition trolley. The revolving cupola rests on the top of this walled support platform, on a system of leaf springs which run around the whole circumference, so that, if hit by an enemy shell, the cupola descends upon the circular outer mantlet, and strain is taken off the support platform.

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Inside the turret itself are two platforms dividing the turret into three compartments, one above the other.

The particulars of this gun follow:

Weight of shell	925 lbs
Muzzle velocity	2,788 f/s
Maximum range	43,600 yds
Caliber	305 mm
Length of barrel	50 cals
Traverse	340°
Elevation	-4° to +45°
Maximum traversing speed	1/2° in 1 sec
Maximum elevating speed	4° in 1 sec

Weights:

Barrel and cradle	79,200 lbs
Armored cupola	638,000 lbs
Base of turret	264,000 lbs
Revolving turret	1,058,200 lbs
Mantlet and armorplate in gallery	391,600 lbs
Anchorage	145,200 lbs
Total weight of turret	1,595,000 lbs

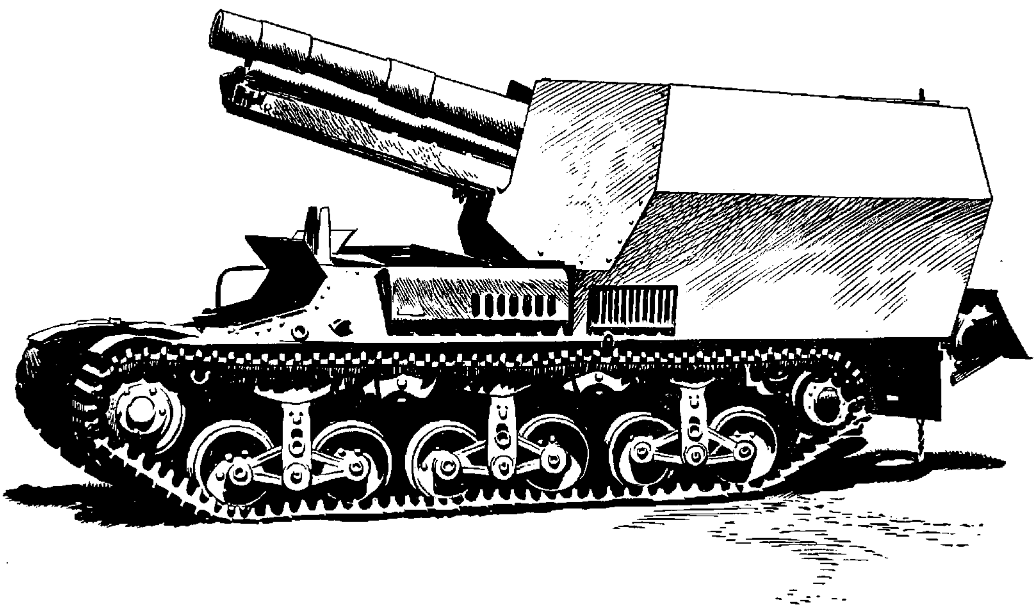
11. 210-MM GERMAN AND ITALIAN HOWITZERS

On several occasions the Axis have used 210-mm howitzers in the North African campaigns. There are four known German howitzers of this caliber, and one Italian. Particulars of the Italian howitzer and the most modern of the German equipment are given below for comparison.

	Italian 210-mm Howitzer	German 210-mm Mörser 18 Howitzer
Length of bore	22 cals	25 to 30 cals
Muzzle velocity	1,730 f/s	1,815 f/s
Weight of shell	225 lbs	264 lbs
Maximum range	17,500 yds	18,300 yds
Elevation	70°	72°
Traverse	75°	360°
Weight in action	17.4 tons	13.2 tons
Weight in draft	20.9 tons	25.3 tons with platform
Method of transport		In two loads towed by a semitracked tractor.

12. GERMAN SELF-PROPELLED 150-MM HOWITZER

The 150-mm medium howitzer, sFH 13, has been provided with a self-propelled mounting, the chassis of the French tracteur blindé 38L, made by Lorraine.



The sFH 13 is equipment of the last war, superseded in first-line units by the 15-cm sFH 18. Particulars of the gun are:

Caliber	149.7 mm
Muzzle velocity	1,250 f/s
Maximum range	9,300 yds
Length of bore	17 cals
Number of grooves	36
Elevation	$+5^{\circ}$ to $+45^{\circ}$
Weight of projectile	92.4 lbs

The particulars of the mount 38L are: length, 14 feet; width, 5 feet 2 inches; weight, 7 1/2 tons; engine, 70 horsepower; maximum speed, 22 miles per hour.

The sketch above shows the following details:

(a) A fixed gun-house of not very thick plate
(b) A limited traverse of not more than about 4 degrees
(c) A spade on the rear of the hull that can be let down to take recoil stresses.

It is notable that in this case an equipment firing a 92-lb shell to a maximum range of 9,300 yards has been mounted on a hull weighing no more than 7 1/2 tons.

This is another case in which the Germans have utilized a standard field gun to make self-propelled artillery. A recent picture shows another 150-mm howitzer, the 15-cm sIG 33, on a German Mark II chassis with the gun on a special mounting built into the hull. There is a three-sided shield no higher than the normal tank,instead of the very high box-like structure for the self-propelled sFH 13.

[redacted] [redacted]

13. JAPANESE INCENDIARY BOMBS

Examination of incendiary bombs dropped by the Japanese over Rangoon showed that the most common type contained, as incendiary filling, a large number of rubber pellets impregnated with phosphorus.

The bomb is 3 feet 4 inches long, 7 1/4 inches wide at the nose, and 9 inches wide at the fin; the latter is 1 foot 3 inches long by 9 inches wide; the cylinder containing the pellets is 7 inches wide and the casing 1/2 inch thick; the pellets are gray in color, 1 1/16 inches long and 1 inch in diameter.

The bomb has a high explosive charge in the nose cap. There is also a steel exploder tube running down the inside of the bomb body. The fuze is instantaneous, and, on explosion, a high fragmentation effect is obtained, the splinters from the nose cap having a very flat trajectory. Pellets are widely scattered, some having been located as far as 50 yards from the point of impact. On explosion of the bomb, these incendiary pellets ignite immediately or within a minute or two of falling. Each pellet produced a flame 4 to 6 inches high burning at a comparatively low temperature. They burn from 5 to 7 minutes, giving off a gray smoke, smelling slightly of burning rubber.

The pellets can be temporarily extinguished by throwing water over them or by covering with sand or earth. Since the pellets ignite after the water has evaporated or the sand has been removed, they should be picked up as soon as possible and placed in a bucket of water or other container and emptied on some open ground; they should be thinly spread out to allow them to burn out harmlessly. Any instrument except the bare hands or highly inflammable material may be used for picking up the pellets; very effective and cheap instruments can be made from old kerosene cans shaped into scoops,pincers, or tongs. In case of necessity the pellets can be picked up by means of two pieces of wood used as "chopsticks."

Sometimes a number of pellets remain in the bomb crater. They should be allowed to burn themselves out if the crater is in the open; the crater should then be widened, using a shovel or other tool in order to expose any further pellets, and these should be dealt with as explained above. If near inflammable material, the crater should be doused with water; the pellets can then be dug out and removed while the earth is still wet.

The pellets should not be allowed to come in contact with any part of the body; they should not be stepped upon as they may burn even through boots or shoes. Fragments of the bomb should not be touched since they will probably be covered with phosphorus, and tools used in dealing with the bomb should be thoroughly washed after use.

The introduction of this phosphorus bomb does not render the stirrup pump any less effective; where fires have been started, the stirrup pump can be brought into operation to control them, and the water will also temporarily extinguish the pellets until they can be picked up. Extreme caution however must be exercised by the No. 1 of the stirrup-pump party in approaching fires caused by phosphorus bombs, in order to avoid injury to himself through crawling over the

pellets lying on the floor. It must be realized that the pellets are dangerous to handle or touch even when temporarily extinguished and apparently inactive.

14. NITROGEN MUSTARD GASES*

Germany is known to possess an almost odorless gas suitable for surprise attack by inclusion in an HE bombardment from the ground or from the air. Documentary evidence shows that the Germans refer to this gas as "Green Ring I." Here it will be called nitrogen mustard. It is only one of several gases with similar characteristics.

It is very probable that Japan also possesses quantities of a similar gas. The plural term "nitrogen mustards" might be used to include this whole group of odorless gases.

a. Physical Properties

In general, the nitrogen mustards are either liquids or solids with low melting points, pale yellow to colorless, and practically without odor. Their volatility varies, some being less volatile than mustard and some more volatile. They are fairly readily hydrolysed by water, but products of hydrolysis are toxic. The toxicological properties of this series of compounds are essentially similar.

Nitrogen mustard is a colorless liquid when pure, with a faint fishy odor; it is also sometimes described as smelling like soap grease. Experiments have shown that its odor is quite marked if the ground contamination is heavy. However, under ideal conditions, even low concentrations can be detected by smell.

Nitrogen mustard has a low freezing point and might therefore be used for high-altitude bombing or spray (if thickened). It is three or four times as volatile as mustard and therefore less persistent. Since higher concentrations are possible, it is more dangerous as a gas, though not as powerful as a vesicant It would require special stabilization if used in hot climates .

b. Detection

The principal danger from the nitrogen mustards is considered to be that their vapors are not easily detected by smell. Munitions with a high bursting charge (20 to 30 percent HE) and containing these gases are indistinguishable from HE on detonation. The nitrogen mustard survives the detonation. By high-altitude spraying--day or night--troops might be subjected to nitrogen mustard

* The following information on odorless nitrogen mustard gases has been compiled by the Intelligence Unit of the Chemical Warfare Service.

without knowing it. Again, troops might move into an area recently contaminated with nitrogen mustard without suspecting its presence; or a change of wind or temperature might result in a dangerous concentration undetectable by smell.

Under such conditions, chemical detection becomes necessary. There are three methods of detection now available.

(1) Detector paint or paper changes to bright red when in contact with liquid HS, M-1, ED, or nitrogen mustard, but is not affected by their vapors. By exposing the detector widely and making frequent inspection, sprayed vesicants are readily detected.

(2) The vapor-detector kit M4 will detect the presence of vapors of the various gases. It will be of special value in cases of odorless or non-irritant toxic gases in the presence of other odors, or in establishing the absence of any poison gas.

(3) Crayon vesicant detectors are useful in detecting definite spots of vesicants on materiel, etc. A special crayon for nitrogen mustards is being developed, although it is not yet standardized.

c. Physiological Effect

The effects of nitrogen mustard on the body are similar to those produced by HS. It is more dangerous to the eyes but less vesicant on the skin. Blindness may result in from 1 to 6 hours, blistering action may be delayed 24 hours, and death due to inhalation may be delayed as much as 4 days.

d. Protection

The gas mask affords a high degree of protection to face and lungs, while oilskin, rubber, and leather give approximately the same degree of protection as against mustard gas. Standard ointments and impregnated clothing relying on chlorination are not as effective as against HS. The greatest danger from this gas lies in the fact that eyes and lungs may be damaged before the presence of the gas is suspected, if reliance is placed on smell alone.

e. Decontamination

The best skin decontaminant for nitrogen mustard is soap and water. Clothing can be decontaminated by aeration and/or washing by the standard laundry method. The protective ointments are also effective.

For decontamination of materiel and ground, the standard methods of bleaching (see FM 21-40 par. 25 (e) (3)), boiling water, or swabbing with gasoline are effective.

15. DEMOLITION CHARGE FOR 20-MM AA/AT GUN

A German document captured in the Middle East states that the standard demolition charge for the 20-mm dual-purpose guns (models 30 and 38) consists of 20 special cartridges placed on the magazine feedway and plugged by means of sandbags. These cartridges contain a 3 1/2-ounce picric or TNT charge. The whole charge is fired by two standard "short" demolition sets, each consisting of a detonator and holder, 3 feet 3 inches of safety fuze, an igniter adapter, and an igniter. These demolition sets have a delay of 100 seconds. The two igniters are fired simultaneously.

Double ignition is provided in order to lessen the chances of a misfire.

INFANTRY

16. WINTER FIGHTING IN RUSSIA

The following article has been drawn from Russian sources and gives some information on certain aspects of winter fighting in Russia, but it should be remembered that this article refers to only one sector and that some of the comments concerning tactics as well as equipment might not hold true for other sectors of the front.

In the Mozhaisk area, around which the fighting described below took place, snow was lying about 3 feet deep in the open, and slightly more in the forest. The weather was very cold, with temperatures sometimes reaching -40 degrees Centigrade (-40 degrees Fahrenheit).

The ice on the Dnieper river near Vyazma and on the Moskva river near Mozhaisk, was thick enough to hold light tanks and artillery. Even heavy tanks could cross by using wide wooden tracks laid on the ice.

Because of the deep snow, infantry were able to move off roads and trails only with difficulty, medium and heavy tanks were barely able to get across country, and cavalry and artillery were confined to the immediate proximity of roads and tracks. Operations were consequently tied to existing communications, and very narrow frontages were employed.

Roads had to be constantly cleared of snow, and even parts of the broad Moscow-Minsk highway could be kept cleared only enough to permit two-way traffic.

Under such conditions, the Russians use some special ski troops, but these were not attached to every unit, and certain divisions operating in the Mozhaisk sector did not have them. Part of each infantry regiment, as well as the division motorized company, however, were trained to operate on skis.

The German organization included one trained ski company in each battalion and one platoon in every other company. This system was apparently

not put into practice, for German skiers were few and poorly trained.

Since many Russians are accustomed to skiing before they are called up, 14 days are allowed for training the normal infantry soldier to operate on skis. The specialist ski troops are given a course of 2 months.

It is reported that during their initial advance the Germans employed a great number of motorcycles. During the winter operations, these were no longer in evidence, although great use was made of bicycles.

The Russian Fifth Army in this sector was operating astride the Mozhaisk-Smolensk road, on a front of about 35 miles, and its normal disposition was with six divisions forward and four in reserve. The division astride the main road worked on a frontage of about 3 1/2 miles, and the normal battalion frontage was about 1,100 yards. Since the advance was normally made along the roads and tracks, actual contact was usually on a very narrow front.

In general, the Russians sought to pin down the enemy garrison by fire, while their main infantry force came forward to finish off the defenders.

They always attempted to gain complete surprise when using these tactics, one of their objects being to deny the Germans time to set fire to buildings. Since surprise was considered so essential, ski parties were rarely accompanied by armored vehicles.

The ski parties were always well-supplied with Tommy guns, and frequently with machine guns and light mortars.

The heavy and medium mortars and antitank guns, pulled on small sleds, were also used. At a later stage medium or heavy tanks were sometimes brought up, either to help forward the main infantry attack or to extricate ski parties which had got into difficulties.

Although the Russians carried out frequent operations by night, the Germans, possibly because they previously had heavy casualties among personnel especially trained for night operations, did not seem to display so much interest in this type of fighting. In the early stages of the war the German troops, including armored units, had made extensive use of night attacks.

At one time during the operations in this sector, the whole of a Russian division's artillery was deployed within 200 or 300 yards of a road, some guns actually firing from the road in column. Although this deployment provided an excellent air target, German air activity was almost negligible, and the Russians could thus afford to take risks.

Russian artillery communications, both wire and radio, were reported good. They used excellent 1/25,000 maps which had enemy positions overlaid by Army Headquarters.

It was found that even deep snow does not lead to more "duds" than under normal conditions. Snow does, however, greatly decrease the fragmentation of shell fire.

In good light the observation of shell fire is much easier in snow-covered country than under normal, summer conditions, but if the light is bad, observation becomes very difficult. For observation, the Russians used a shell with a red smoke-box, experience having shown red to be the most effective color under snow conditions.

In the area between Mozhaisk and Gzatck, the forward German defenses were about 6 miles in front of their main line of resistance. All towns and villages were held as strongpoints, and where villages were some distance apart, they were joined by small defense areas established on roads and paths. These defense areas, however, tended to be rather disconnected and patchy except for the area close to the main line of resistance.

The German strongpoints were generally based on small posts which were designed to take one antitank or machine gun, and which were sited on commanding ground, in groups of four or eight, each post being connected to the other by snow parapet tracks. When time permitted, each post was dug down to a depth of about 4 feet, with a snow and earth parapet, and the whole roofed by logs and boards.

The Russian field defenses, on the other hand, were started with a snow parapet about 8 feet thick. Water was poured on this until it froze, making it bulletproof. If available, logs were used to strengthen it.

For later development, digging was nearly always possible where there was sandy soil. Other types of ground were loosened by charges exploded at a depth of about 4 feet.

The Germans and Russians both used a great deal of heavy wire in forests, with entanglements stretched from tree to tree. Though the German belts of wire sometimes proved a considerable obstacle, it was often found that they were not adequately covered by fire.

In open country the Russians used concertina wire, anchoring it about half embedded in the snow. Frequently they put it completely under the snow in order to obtain surprise, but the latter method, of course, was not used against skiers.

Russian antitank obstacles normally consisted of ditches, wooden posts of at least 6 inches diameter sunk at about 45 degrees, or crow's-feet of very heavy angle-iron. They also used a heavy, coiled, barbed concertina-type wire, buried under the snow to tangle tank tracks. The only effect of snow on antitank obstacles was to make them more difficult to locate and, therefore, more likely to trap a tank.

The Russians found that antitank guns can usually obtain excellent targets if they are sited to fire over areas covered by deep snow, which cuts the speed and maneuvering ability of tanks considerably.

Russian antitank mines were laid at any depth in the snow without their efficiency being affected. As a matter of fact, the more time the Russians had to prepare a minefield, the deeper they put the mines. Both Russians and Germans used a system by which their antitank mines under the snow were linked together in groups for sympathetic explosion.

The Germans soon developed a wooden mine, both for antitank and antipersonnel use, and this mine succeeded, to a large extent, in defeating the efficient Russian mine detector. Neither the Russians nor Germans appear to have made any use of dummy antitank mines.

The Germans used white, red, and green Very lights for signals, but the Russians generally managed to discover their meanings and gain valuable information.

In withdrawal, the Germans sited their defenses in considerable depth and used leapfrog methods of retirement. Each German division normally had a rear guard of an infantry combat team. Divisions usually withdrew on a front of about 6 miles.

The Germans followed a definite policy of destroying all buildings in villages which they evacuated, principally in order to deprive the Russians of accommodations. Destruction proved comparatively easy, since the buildings are normally made of wood.

There was one German armored division in this sector, and the unarmored portion of this unit was detached and used to hold a section of the line. The tanks which were deployed along the front in small groups of four to six were often supported by antitank guns. These groups stuck almost exclusively to roads and trails. The German system, when fighting a rearguard action, seemed to be to present the boldest possible front to the enemy by retaining these small groups on roads leading into the position, keeping them parallel to the new main line of resistance. At the same time they always endeavored to clear at least one lateral track immediately in rear of their main line of resistance, in order to facilitate reinforcement of threatened sections of the line.

German artillery was not very much in evidence in the Mozhaisk sector, and there were few guns heavier than field artillery. The Germans relied mainly on mortars, infantry guns, and antitank guns.

In their main defensive positions the Germans sited their mortars in batteries of four or more, about 500 to 600 yards in the rear of their main line of resistance. Field artillery was sited in depth, although the forward batteries were usually not more than 1,600 or 1,700 yards back. Their normal reaction to any threat was intense fire from the 81-mm mortars, for which they seemed to

have a more than adequate supply of ammunition. The Germans usually fired off everything available just before a withdrawal, and the Russians learned that when sudden and very heavy mortar fire came down, and no counterattack materialized, the Germans were almost certainly withdrawing. They were then able to take appropriate action.

In forest country the Germans made every effort to block tracks by felling trees and erecting abatis. Wire was used only on those positions which were to be defended for some time.

The Germans destroyed all bridges, both large and small, in their retirement. East of Vyazma they destroyed the railway very effectively, demolishing or removing all sections which the Russians had not already removed in their own retirement. It is of interest to note, however, that despite the destruction, the Russians got a locomotive through to Mozhaisk 7 days after the capture of the town.

The Germans used a large number of antitank and antipersonnel mines in their retirement, sowing them around demolished bridges or culverts in order to catch vehicles using detours. Some minefields were laid in great depth and entirely filled the clearing normally found at each side of main roads through the forest. They also used delayed-action mines and booby traps, although not to a very great extent. Booby traps were usually attached to bright objects like scissors, spoons, or badges.

Cooperation between small bodies of Russian infantry and their tanks appeared excellent. The infantry's sole method of communication with tanks was by light signals, and these were generally used to indicate a target or an objective to be attacked.

There were very few instances in this sector of German tanks attacking under cover of smoke. When smoke was used, it was apparently put down by a normal Nebelwerfer unit.

The reconnaissance unit of the 5th German Tank Division included a certain number of French Panhard armored cars. These vehicles have completely French armament, including coaxial antitank guns and machine gun, and are equipped with Michelin (heavy pneumatic) tires.

German guns on self-propelled mountings were encountered, but the Russians say that in this sector they were normally employed in a defensive role only.

In the earlier stages of the fighting the Germans were operating fairly actively with flights of three or four planes, but after winter came, their efforts were limited mainly to hit-and-run bombing raids by single machines, and during the Mozhaisk operations the Russians definitely had superiority in the air. Russian air units supporting the army work directly under the control of the army staff, for the Russians have no corps organization. There is an air force staff

officer at each divisional headquarters. The Russians claim that any request for air support from the commander of an infantry regiment will be answered by bombs on the ground within 1 hour, provided that aircraft are available.

Russian air support during the Mozhaisk operations consisted chiefly of bombing retreating German columns, taking full advantage of the extent to which the Germans were tied to the roads. In attacks against these columns, Russian aircraft armed with cannon soon found it advantageous to carry antitank projectiles. The importance of adequate antiaircraft fire arrangements for such withdrawing columns needs no emphasis; and the Russians were greatly impressed by the intensity of the fire from German mobile antiaircraft weapons and especially by the volume and control of small-arms fire.

German air attacks against Russian land forces, especially on roads, very often consisted of dive-bombing with 100-kilogram (220-pound) and, sometimes, 250-kilogram (550-pound) bombs. The accuracy of the German attacks, however, varied directly with the amount of antiaircraft fire encountered.

For camouflage, Russian specialist ski troops wore white coats with attached hoods, while ordinary infantry not equipped with them usually rolled in the snow before going into action. This makeshift arrangement, which produced a mottled effect, was found especially good against a forest background. Similarly, the best form of vehicle camouflage proved to be a pattern of small blobs of white paint, laid on very thickly.

Against winter air observation it proved practically impossible to conceal work actually in progress. Tracks in snow also presented great difficulties, as did smoke from fires. Against ground observation the judicious piling up of snow was found effective, but white material was needed to conceal loopholes.

The Russians lubricated all their weapons with oil of a specially thin arctic type, and recoil mechanisms were also filled with a special liquid. Water-cooled jackets of machine guns were filled with glycerin. All lubricants used were said to be proof down to at least -50 degrees Centigrade (-58 degrees Fahrenheit). Small arms which gummed up were first wiped entirely dry, lubricated with kerosene, and then fired, before receiving normal lubrication.

Since motor transport of all types gummed up very quickly at low temperatures, the Russians provided heaters for all their vehicles. A 1 1/2-ton truck, for example, would get 1 heater; a heavy tank, 12. In addition, mobile heaters, such as those used for ungumming airplane engines at airdromes, were sometimes used.

The lighter Russian weapons were frequently carried on small sleds consisting of a superstructure on a pair of skis, while heavier sleds, for larger weapons, were often pulled along the narrow forest trails by four ponies harnessed in tandem. Also, about 50 percent of the German transport were reported to be working with sleds.

The Germans' red tracer bullets proved very effective against the snow background; the Russians, except for their antiaircraft, had only white tracer.

The Russians gave troops operating in cold weather one hot meal around dawn and another after nightfall. During the day, however, troops existed on a field ration composed largely of bread. Food for the hot meal was cooked in field kitchens--small trailers on two wheels, several of which were towed behind one truck. The food was then sent forward on sleds, in small metal vacuum-flask containers.

As the Germans withdrew, they often burned the villages behind them, leaving the ground thawed around each house. The Russians at once dug this ground down to about 5 or 6 feet. It was then roofed over with logs, tarpaulin, or brushwood, and floored with brushwood, or with straw if available. A stove, with a pipe chimney, was installed in the dugout. These stoves were usually improvised from old oil drums.

Where there were no villages, the Russians would dig the snow in the forest down to ground level, and build up a thick snow wall around an area of 8 feet by 12 or 15 feet. Evergreen fir branches would be used to line the floor and walls, and the compartment would be roofed with more branches, as well as a tarpaulin, if available. Finally the inevitable stove and chimney were added.

For these winter operations, the Russian soldiers were provided with good thick underclothing, of which they frequently wore two sets. Over this was a thick shirt and pullover. Over the pullover went padded trousers and coat, and then an overcoat or the short sheepskin shuba. Headgear consisted of a fur cap, a winter cap, and, frequently, a scarf belonging to the individual soldier. The Russian soldiers wore two pairs of gloves: an inner pair with the first two fingers and thumbs free; and an outer pair of mittens, worn when the use of the trigger finger was not required. No blankets are carried in a Russian division.

On his feet the individual soldier wore the <u>varlenki</u> or felt boot. Socks were not worn under the <u>varlenki</u>, but a piece of cloth, 2 feet by 1 foot 6 inches, was wrapped about the feet and ankles. In deep snow, trousers were worn outside the <u>varlenki</u> and tied round the bottom to prevent snow getting inside the boot.

Russian opinion is that the <u>varlenki</u> is the most satisfactory footwear for snow, and that it has enough wear in it to last through a complete winter. Although it is a felt boot, the wear is less pronounced than might be expected, since the troops can always march on the soft snow by the road. The <u>varlenki</u> has the advantage of drying very quickly in front of a stove, although this is not usually necessary, for in Russia one normally meets a dry type of snow.

Certain specialist ski troops wear a special ski boot, but the ordinary infantry ski in their <u>varlenki</u>.

The Russians claim that they had very few cases of frostbite, and those

that did occur were nearly always due to carelessness. The most dangerous areas were found to be the nose and cheek bones, and for troops in short coats, especially skiers, the private parts. Ski troops were issued warm suspensory bandages. Unit commanders issued vaseline or goose fat to their troops to smear on their faces, when low temperatures combined with sharp winds.

The wounded had to be brought in as quickly as possible if they were to escape frostbite. They were collected by regimental stretcher-bearers using low sleds built on two skis.

The Russians claim that the cold had no numbing effect mentally unless the men were tired; that on the contrary it had rather an opposite result, and that troops could go on for long periods of time provided that they were kept on the move, the limiting factor being lack of sleep.

The Russians noticed an obvious drop in the efficiency of German troops when the temperature fell below -20 degrees Centigrade (-4 degrees Fahrenheit). In extreme cold, Germans frequently allowed themselves to be rounded up in houses rather than go outside and face the cold.

The winter clothing of Germans taken prisoner was definitely inadequate. A few wore a second overcoat, but quite frequently they had only their normal clothes. As a result, many suffered from frostbite.

For keeping open the roads in rear of their advancing troops, the Red Army relied almost entirely on large working parties of peasants, who produced excellent results. Snow ploughs were available but apparently were not utilized to any great extent.

On the Mozhaisk front, partisan fighters were very active behind the German lines, and the various guerrilla bands were in close touch with the Red Army commanders. Parties of 40 or so would come through the German lines, receive definite tasks, such as destruction of specific railway bridges, and return through the enemy lines by night. These partisan fighters were armed with rifles and a few Tommy guns and wore civilian clothes. A number of girls were to be found in these bands, which were composed mainly of middle-aged men.

17. GERMAN TACTICS IN THE FINAL PHASES AT KHARKOV

In the Russian offensive against Kharkov in May their forces became overextended and were encircled by the Germans. Here they encountered several innovations in the system of hasty fortifications which the Germans threw up to prevent a breakout. These defenses were built around the basic infantry strongpoints, but the way the Germans used their combined arms and armored equipment is revealing.

Figures 1 and 2 in the accompanying sketches outline the systems set up

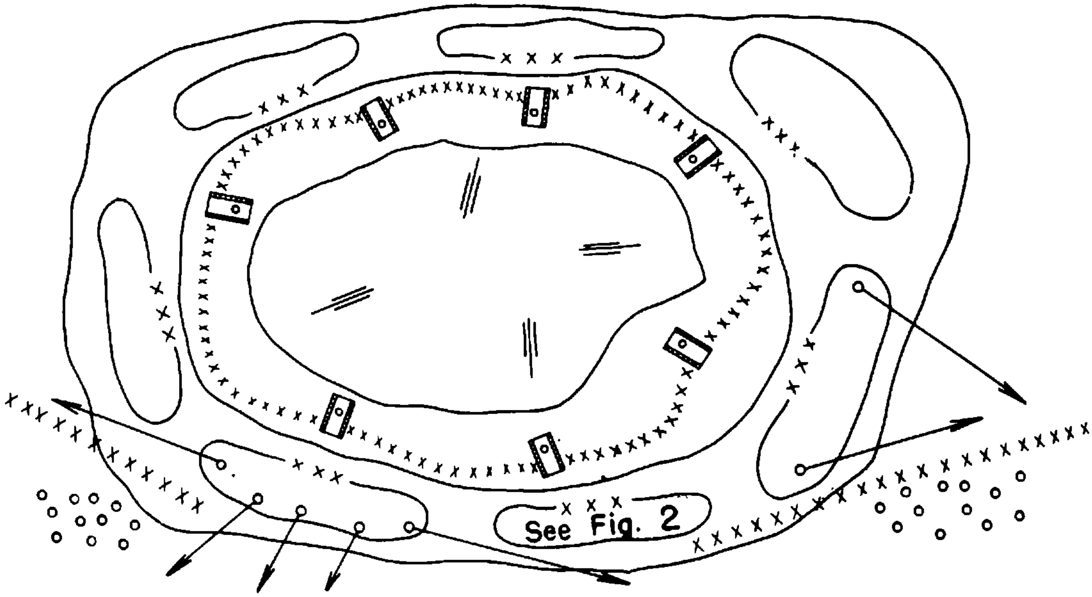


Fig. 1 - Center of resistance

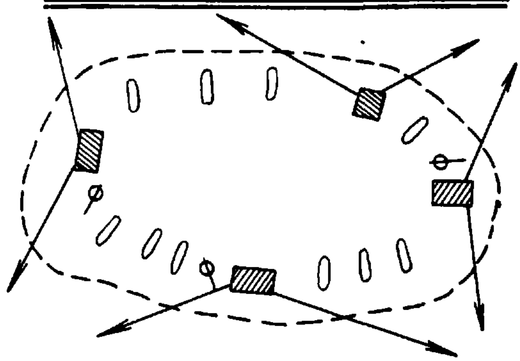


Fig. 2 - Strongpoint

LEGEND

- Artillery capable of 360° fire
- Tanks dug-in
- Wire entanglement
- Mine fields
- Antitank guns
- Dugouts
- Fox holes

by the Germans around the encircled Russian forces. The sites of the defense areas were selected so that each island of resistance could mutually support the ones adjacent to it.

Each island or center of resistance was formed by three concentric rings. Within the center ring, self-propelled artillery capable of all-around fire was emplaced. In the next outer ring, tanks were camouflaged and embedded in the ground so that they served as pillboxes for their machine guns and other armament. The outer ring was formed by entrenched infantry units provided with their normal infantry weapons, including antitank guns and mortars.

Wire entanglements were laid between the embedded vehicles of the second ring and along the channels of fire of the infantry weapons. Clever signaling devices such as cowbells and self-igniting firecrackers were hung on the wires and nearby bushes to warn of an enemy approach at night.

In the gaps between centers of resistance, minefields were laid and charted, and high-trajectory weapons laid to cover defiladed areas.

Outside this system of defensive areas which encircled the Russian troops, mobile combat teams were located, ready to rush to any part of the circumference that might be threatened either from within or without.

18. CREW AND COMMUNICATIONS OF GERMAN MARK IV TANK

The duties of the various crew members of the Mark IV tank are generally similar to those performed by the crews of our own medium M3 and M4 tanks. A German training pamphlet captured in Libya gives the following details on the crew duties and communications of the Mark IV.

a. Duties of the Crew

The crew consists of five men: a commander, gunner, loader, driver, and radio operator. The latter is also the hull machine-gunner.

(1) Tank Commander

The tank commander is an officer or senior NCO and is responsible for the vehicle and the crew. He indicates targets to the gunner, gives fire orders, and observes the effect. He keeps a constant watch for the enemy, observes the zone for which he is responsible, and watches for any orders from the commander's vehicle. In action, he gives his orders by intercommunication telephone to the driver and radio operator, and by speaking tube and touch signals to the gunner and loader. He receives orders by radio or flag, and reports to his commander by radio, signal pistol, or flag.

(2) Gunner

The gunner is the assistant tank commander. He fires the turret gun, the turret machine gun, or the submachine gun as ordered by the tank commander. He assists the tank commander in observation.

(3) Loader

This crew member loads and maintains the turret armament under the orders of the gunner. He is also responsible for care of ammunition, and when the cupola is closed, gives any necessary flag signals. He replaces the radio operator if the latter becomes a casualty.

(4) Driver

The driver operates the vehicle under the orders of the tank commander or in accordance with orders received by radio from the commander's vehicle. So far as possible he assists in observation, reporting through the intercommunication telephone the presence of the enemy or of any obstacles in the path of the tank. He watches the gasoline consumption and is responsible to the tank commander for the care and maintenance of the vehicle.

(5) Radio Operator

He operates the radio under the orders of the tank commander. In action, and when not actually transmitting, he always keeps the radio set to "receive." He operates the intercommunication telephone and takes down any useful mes-

sages he may intercept. He fires the machine gun mounted in the front superstructure. If the loader becomes a casualty, the radio operator takes over his duties.

b. Communications

The following means of communication may be used:

(1) External: radio, flag, hand signals, signal pistol, and flashlight.

(2) Internal: intercommunication telephone, speaking tube, and touch signals.

For the radio, the voice range between two moving vehicles is about 3 3/4 miles and CW about 6 1/4 miles.

The flag is used for short-range communications only, and the signal pistol for prearranged signals, chiefly to other arms.

The radio set, in conjunction with the intercommunication telephone, provides the tank commander, radio operator, and driver with a means for external and internal voice communication, the same throat microphones and telephone receiver headsets being used for both radio and telephone.

When the control switch on the radio is set at EMPFANG (receive) and that on the junction box of the intercommunication telephone at BORD UND FUNK (internal and radio), the commander, radio operator, and driver hear all incoming radio signals. Any one of them can also speak to the other two, after switching his microphone into circuit by means of the switch on his chest.

For radio transmission, the switch on the set is adjusted to TELEPHONIE. The telephone switch may be left at BORD UND FUNK. Either the tank commander or the radio operator can then transmit, and they and the driver will all hear the messages transmitted. Internal communication is also possible at the same time, but such conversation will also be transmitted by the radio.

If the radio set is disconnected or out of order, the telephone switch may be adjusted to BORD (internal). The tank commander and driver can then speak to one another, and the radio operator can speak to them, but cannot hear what they say. The same applies when a radio receiver is available but no transmitter, with the difference that incoming radio signals can then be heard by the radio operator.

The signal flags are normally carried in holders on the left of the driver's seat. When the cupola is open, flag signals are given by the tank commander, and when it is closed, the loader raises the circular flap in the left of the turret roof and signals with the appropriate flag through the port thus opened.

The signal pistol is fired either through the signal port in the turret roof, through the cupola, or through one of the vision openings in the turret wall. The signal pistol must not be cocked until the barrel is already projecting outside the tank. It is only used normally when the vehicle is stationary. Its main use is giving prearranged signals to the infantry or other troops.

When traveling by night with lights dimmed or switched off altogether, driving signals are given with the aid of a dimmed flashlight. The same method is also employed when tanks are in a position of readiness and when in bivouac.

Orders are transmitted from the tank commander to the gunner by speaking tube and by touch signals. The latter are also used for messages from the commander to the loader, and between the gunner and loader.

19. SECURITY MEASURES OF A GERMAN ARMORED DIVISION

In the late spring of 1942, both the Germans and the British on the Gazala--Bir Hacheim line were building up strength for offensive action and, at the same time, organizing their own defensive systems to repulse the expected enemy attack. A captured German order issued by the Commander of the 15th Armored Division contains several interesting notes on these German defensive preparations.

Comparing the position of the division to that of a "spider lying in wait... for its victim," the commander ordered all elements of the division to be ready for action as follows:

(a) All front-line troops, immediately upon attack by the enemy;

(b) A specially designated task force, within an hour;

(c) The remainder of the division, within 3 hours.

Instructions were given for thorough ground reconnaissance to be carried out by all units down to and including platoons. Artillery observers were ordered to take positions much farther forward than normally, since "otherwise, after the first shot, dust develops and there is no possibility for direction of fire."

Apparently a tank company, in addition to the normal armored-car patrols, was to be held in readiness for action at all times. This company, however, was not to be committed unless the enemy attacked in force, and above all, was not to engage routine enemy patrols.

Just as the tank company was to be held as a reserve, the remainder of the division's tanks was not to be committed until the artillery and Panzerjäger units had engaged the enemy. Apparently, the German commander expected the

British attack to consist primarily of tanks.

In addition to the regular minefields, dummy minefields were ordered laid. The commander emphasized that a great deal more attention should be given to making these fields realistic, pointing out that a captured British document indicated that the German dummy minefields were ordinarily too easily distinguished from the real ones.

Knowing that the British had a justifiable fear of the 88-mm gun, the commander ordered that dummy 88's be constructed with trucks and old telephone poles.

In addition to these measures of deception, dust generators (no description given) were to be used for simulating vehicle movements; and captured British trucks were to be camouflaged as tanks.

Great emphasis was laid on utilizing existing materiel to the utmost to achieve greater combat effectiveness. Unit leaders were requested to submit suggestions on how a larger amount of ammunition and fuel could be carried by the existing transport facilities. In this connection they were asked to discard all possible material and equipment which would be unnecessary for combat.

MILITARY INTELLIGENCE

20. SOME ENEMY PRACTICES USED IN INTERROGATING PRISONERS OF WAR

By resorting to tricks and subterfuge to entice the unwary, the enemy hopes to extract information of value from captured prisoners. Here are some of these tricks as recently reported.

In a building set aside for interrogation, prisoners are questioned in a half-hearted manner and are then transferred to another room where they find three or four other "prisoners." These prisoners are, in fact, Italians or Germans speaking perfect English. To avoid detection they are often dressed in a uniform of a service other than that to which the real prisoner belongs (for example, RAF when the prisoner is in the army, South African when the prisoner is English).

A smiling Nazi may say in an attempt to ingratiate himself, "England and Germany should be fighting together. We don't hate one another."

Sometimes a prisoner is not questioned for several days--perhaps weeks. If he is in the hospital, a "wounded" German or Italian is sent along who has been in England and speaks some English. He has all the charm of a Fuller brush man, and gradually lets it leak out that he is anti-Nazi, and perhaps has a row with a fellow Nazi. He takes his time, and gradually the conversation veers around to the war.

Real interrogators use another method to get prisoners to talk. "We know so much there is nothing you can tell us," he remarks, as he flips over a lot of important-looking papers. He then attempts to provoke the prisoner into proving that he is not the ignoramus the interrogator tells him he is.

The prisoner may be marched into a tent lighted by one flickering lantern. There is a good deal of side-play. The interrogator snaps out the routine questions: "Name - rank - number?" When the next question is greeted with silence, the sentry is ordered to leave the tent. The interrogator fingers his revolver. "I don't want to resort to methods we dislike," he says, and hopes the prisoner will believe the opposite. He may be taken into a confined space, such as an armored car. The interrogator talks in a low voice, and explains that he wants some important information and he is determined to get it. He is candid. "You are alone, you have a family. You want to live. It is nice to be a hero when someone is looking, but you are alone."

The note of death is constantly repeated in an attempt to break down morale. The interrogator, however, is not going to kill the goose which may lay the golden egg; besides, there are thousands of enemy (German and Italian) prisoners,and news of what happens in German prison camps travels fast.

Breaking down resistance and morale is the first object of the enemy interrogating officer. To encompass this, physical fatigue is often induced by forced marches, light rations,and inadequate shelter. Another trick is the spreading of fantastic tales about Russian reverses, Japanese successes, and Allied losses. Then there is the time-worn trap: "Your comrades have told us everything so why don't you?"

In a Nazi or Fascist state, everyone is a suspect of the secret police. They are long practiced in eavesdropping, and this experience is used in wartime. If other methods fail, prisoners are put together in the most innocent-appearing circumstances. A hidden microphone reveals to a listening enemy any matters of military interest that are talked about.

The answer to these tricks, and there are others, is the maintenance of rigid silence.

Direct interrogation is a war of attrition between prisoner and interrogator, and the battle is lost by the one who tires first. If it is the interrogator, the prisoner is passed on as "no good" to join his countrymen in a prisoner-of-war camp. If, however, he tries to bluff the interrogator by giving him false information, or to appease, by giving half-truths; if any chink is found in his armor of silence, he will often remain for weeks and weeks under process, much to his own personal discomfort. The tough prisoner is not only admired by the enemy but, if he wins out, fares better in the end. Thus the attitude of "name, rank, and number only" not only serves country and comrades, but is without doubt in the best interests of the individual.

Conversations on military matters must always be resolutely avoided; plans to escape discussed only in the open. Further, attempts to persuade a prisoner that he can relieve the anxiety of his family, by broadcasting must be resisted. Such offers are made to build up enemy radio propaganda.

Finally, personal papers should never be carried into battle. Most insignificant pieces of evidence, personal letters, hotel bills, tickets, give clues to a competent interrogator.

21. ITALIAN MEASURES FOR CONCEALING A WITHDRAWAL

Camouflage in the desert is ordinarily much more difficult than in the woods, fields, and villages of more familiar terrain. It is possible to use the inevitable dust, however, to prevent the enemy from making exact estimates of the number of vehicles being moved. The following captured Italian order gives some details of measures taken by the Italians to conceal a withdrawal.

"During the next few days, the withdrawal of troops from the sectors of the Trento Division and the remainder of the 5th Light Division has to be concealed, and the arrival of numerous reinforcements has to be simulated. To this end, the following directions will be carried out. The measures must not be clumsily executed or they will fail in their purpose.

"It will be especially important to maintain lively patrol activity and to attack the enemy repeatedly at night, thus creating the impression that an offensive is imminent. The simulated motor transport movements must be carried out under the guidance of an experienced officer. The Trento Division is requested to send in, by orderly officer on the previous evening, particulars pf the measures it intends to carry out during the following day and night.

"The Division will order the employment of planes from time to time.

"April 28---The following measures will be carried out.

"In the morning until 0900 hours, and after 1800 hours in the evening, the 8th Machine Gun Battalion and Bollbrinker Battalion of the 5th Tank Regiment are to keep up a lively traffic in the direction of the front, raising much dust. The 8th Machine Gun Battalion will form 2 or 3 motor transport columns of about 15 vehicles each, and the Bollbrinker Battalion will form one such column to maintain traffic on the different roads and trails leading to the front. During the day, single vehicles are to be used to raise dust. In addition, the 5th Tank Regiment will simulate heavy traffic running in both directions on the El Adem--Capuzzo road, as far as 40 km east of El Adem, every day.

"Battery A, 75th Artillery Regiment, is to simulate the presence of a battalion by frequent firing by platoons, and by the use of sniping guns. Harassing fire will be laid down. Ammunition consumption is to be approximately

equal to that of the battalion to date.

"The Bollbrinker Battalion is to use its immobilized tanks to give the enemy the impression that the position is being held in the same strength. Every opportunity must be taken to capture enemy tanks or vehicles of any type.

"The 8th Machine Gun Battalion must maintain its patrol activity on the level of that carried out up till now by the 8th Machine Gun Battalion and the 200th Engineer Battalion together. Prisoners are to be taken if possible. At night, patrols are to fire rounds frequently and send up white Very lights (red Very lights in case of enemy attack, green in case of enemy tank attack).

"Frequent radio test-calls within the divisional system, and with the von Herff Group, will be made according to oral instructions to the 3d Signal Company.

"April 29---The Trento Division will organize a lively traffic (with large numbers of vehicles from the division trains) in the direction of the front in the early morning and evening, so as to create the impression of further reinforcements. Under the command of an officer, vehicles are to be formed in columns, like those of the 8th Machine Gun Battalion and the Bollbrinker Battalion on April 28. During the daytime, single vehicles will be used to simulate heavy column traffic in both directions...[More details on where heavy traffic is to be simulated.]

"Battery A, 75th Artillery Regiment, will continue its tasks of April 28, but will increase its ammunition expenditure.

"The 8th Machine Gun Battalion will maintain patrol activity as on April 28.

"Radio activity will be continued as on April 28...

"April 30---All measures ordered April 29 will be continued on an increased scale. This applies particularly to the vehicle movements by the Trento Division, the 8th Machine Gun Battalion, and the Bollbrinker Battalion, designed to simulate the arrival of reinforcements; this applies also to the fire of Battery A, 75th Artillery Regiment.

"Special actions by assault detachments will be ordered for the night of April 30 to May 1."

22. OPERATIONS OF THE GERMAN TANK RECOVERY PLATOON

British sources give recent information on the methods employed by the recovery platoon of (tank) workshop companies. This information was obtained from prisoners of war.

The towing vehicles and trailers of the platoon are sent forward to regimental headquarters and operate under its direction.

The principle now used is to have two or three recovery vehicles forward with the fighting units. These vehicles advance in the line of attack and cruise across the width of the battle front. The Germans believe that hostile forces will be preoccupied with the German tanks and will not bother with the recovery vehicles, no matter how close they are.

If a member of a tank crew orders the driver of a recovery vehicle to tow his tank to the rear, the former assumes responsibility for the action--in case it later proves that the damage is negligible and could have been fixed on the spot by the repair sections. However, asking that a damaged vehicle be towed away is always permissible if it is in danger of being shot up.

The towing vehicle usually goes forward alone and tows a disabled tank away by tow ropes. Towing is used in preference to loading on the trailer, as this latter operation may take 20 minutes (regarded by a prisoner as good time under battle conditions).

The recovered tanks are towed to an assembly point behind the combat area, where they are lined up so as to protect themselves as far as possible. Trailers may be used to take back the disabled tanks from this point to the workshop company.

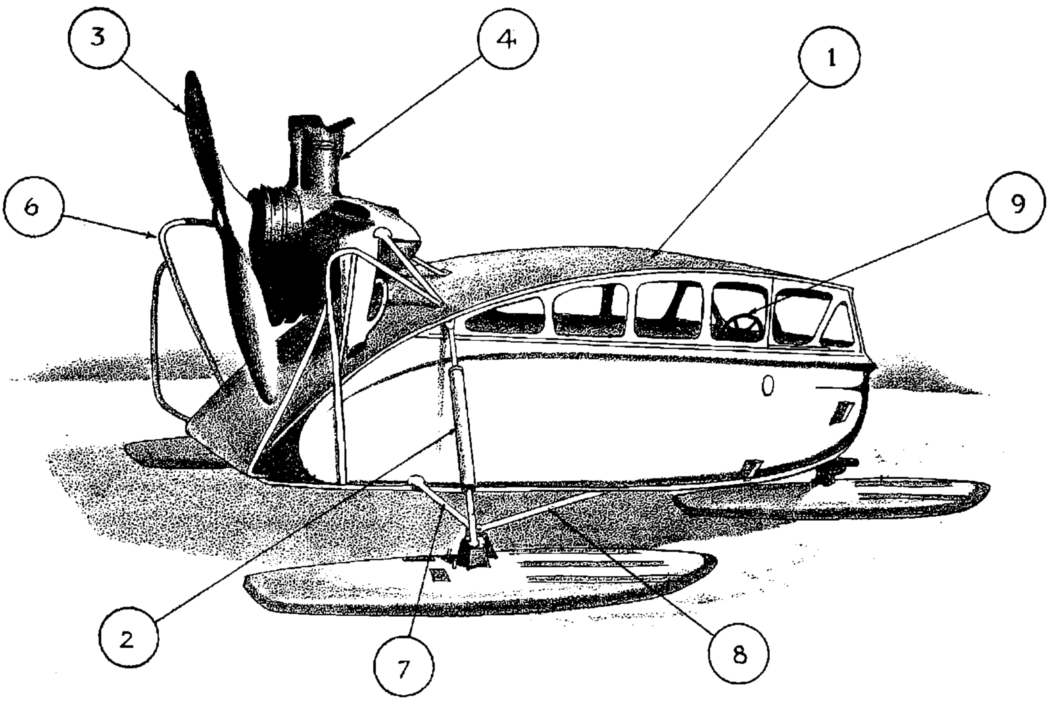
According to this report, however, trailers are being used less and less, and their use is confined mainly to roads. On roads, they enable a higher speed to be maintained, do not weave as much as a towed tank, and do not cut up the road surface. On the desert, trailers would be used on bad ground rather than where there is good going.

The PW's reported that drivers of recovery vehicles did front-line duty for about 8 days at a time; then they worked at the rear, between assembly point and workshop.

23. PROPELLER-DRIVEN SLEDS

The severity of the Russian winter, with its heavy snowfalls, creates serious transportation problems. This is particularly true in northern Russia, where lack of roads formerly made dog- or reindeer-drawn sleds necessary for transport. Soviet technical skill and ingenuity, however, have successfully coped with the problem by developing mechanized sleds, which have good traction both on hard-packed snow and soft new snow.

The most satisfactory and efficient type of mechanized sled for winter transport has been found to be the aero-sled, powered by an airplane-type engine and mounted on either three or four skis.



The accompanying sketch shows a general view of the Soviet NKL-16 aero-sled with an M-11 motor. All accepted types of aero-sleds have a closed streamlined cabin (1) which transports six to eight persons plus freight, depending on the horsepower of the motor and design of the sled. The cabin is mounted on shock absorbers (2), which are connected to the three (or four) skis. The motor (4) is generally mounted in the rear with the pusher-type propeller (3) and a guard (6). The skis are connected to the body also by means of universal-joint semiaxles (7) and "unloading" connecting rods (8).

This three-rod type of mounting of the skis insures proper shock absorption and fixes the skis rigidly in relation to the body of the sled. A turn of the steering wheel (9) causes the front ski to turn. In the four-ski-type aero-sleds of the latest design, the two rear skis glide in the tracks made by the front skis. The brakes are applied by pressure on a foot pedal which causes 1 to 1 1/2-inch metal rods to protrude from the bottom of the skis and engage in the snow. An air-cooled motor in aero-sleds eliminates radiator and water complications in the cylinder sleeves and lends to light design.

The following discussion of various aspects of the problem of transport operations by aero-sled is taken from a recent issue of a Soviet trade magazine.

"Aero-sleds must satisfy certain technical requirements. For example, the supporting surface of the skis must completely safeguard the sled from falling through the snow or getting stuck in it. Experience in the U.S.S.R. has proved that the load weight of the sled while in movement must not exceed 1,200 to 1,350 pounds per square yard of supporting surface. The total weight of the loaded sled must not exceed 33 pounds per engine horsepower.

"Other essentials include durability of construction, using inexpensive, plentiful materials. The driver and crew must be protected from headwinds and must be able to observe the road to the front and on both sides. Brakes are needed to assure safe descent on steep inclines, especially on slippery and rolled roads. The propeller must be equipped with some form of guard to prevent accidents.

"It may be said that the essential qualities of aero-sleds are: simplicity of manufacture, low cost, ease of repair, and good driving power.

"The improvement of travel qualities of aero-sleds can be accomplished by: reducing the weight of the sled by lighter construction, reducing the load capacity (a serious disadvantage), or increasing the traction power of the propeller. The latter may be accomplished by improving the design of the propeller, or using a motor of greater power. It may be considered that the present models of aero-sleds yield roughly a power effort of the propeller equivalent to 6 to 6.5 pounds per motor horsepower.

"Although the average speed in actual work is lower, it is possible to drive aero-sleds at a speed of 20 to 30 mph, depending on the snow surface and the experience of the driver.

"As the Soviet Union lacks winter roads, the opportunities for using aero-sled transportation are very numerous. For that reason, in spite of the favorable achievements in design and efficiency for use over even rough snow and ice, many improvements can yet be made. A switch to the use of heavier fuel, as well as to simple and inexpensive motors and steel propeller, should be combined with further perfection of body design and of moving parts."

On the basis of sketches of aero-sleds which have appeared recently in the Soviet press, it seems probable that the Russians are employing aero-sleds as combat vehicles, both as a reconnaissance car mounting a heavy machine gun, and as an armored fighting vehicle with a sizable-caliber gun mounted in a revolving turret. No details, however, are available on this aspect of the employment of aero-sleds.

24. REPORT OF ITALIAN PILOT ON "CROWS FEET"

Tactical and Technical Trends, No. 11, p. 36 described this particular metal spike and its special use on highways and landing fields,

The pilot of an Italian bomber who happened to land on a field where the Germans had apparently dropped these spikes, describes his experience. He states that they came as a surprise and caused considerable confusion. Both tires on his plane were punctured when taking off. He was not aware of what happened until coming in for a landing and it was with difficulty that the plane was kept from turning over.

Despite efforts to get them off the field, it was stated that some spikes always remained. When dropped on loose and sandy surfaces, the spikes were sometimes completely buried and were not discovered, and worked up into the air craft tires when run over.

25. MARKINGS ON GERMAN MOTOR-MAINTENANCE VEHICLES

It is evident that motor-maintenace vehicles should bear distinctive markings by which they may be readily identified. On the other hand, an order captured from the Germans would appear to indicate that such vehicles should not be so clearly marked as to permit easy identification by enemy observers.

The above-mentioned order was captured from a German reconnaissance unit operating in North Africa and reads as follows:

"It is forbidden to mark gasoline and oil supply trucks with distinctive yellow or black-white-red disks, and these must be removed. Enemy aircraft can destroy easily recognizable gasoline and oil supply vehicles with incendiary ammunition. Gasoline supply trucks and gasoline-and-spare-parts supply trucks are to be marked with a blue 'B' made to stand out slightly by a pale yellow outline around its edges. Vehicles belonging to maintenance groups, sections, and light detachments are to be marked with a special 'J'."

26. NEW GERMAN METHODS AGAINST RUSSIAN WINTER CONDITIONS

No Russian campaign could safely be undertaken without taking into account the challenge to an invading army's staying power to meet the hardships and danger imposed by "General Winter."

It is reported that the German Wehrmacht intends to make large-scale use this winter of diesel oil as a radiator fluid for motorized equipment in Russia, to protect motors both against low temperature and penetrating winds. Diesel oil will be used in normal motors which require draining during long stops and require the heating of oil before motors can be restarted, and also used in those few motors now being equipped with built-in warming apparatus. The use of oil was determined after experiments revealed that it has a freezing point below -40 degrees Centigrade, a boiling point higher than water, does not corrode motors or radiators, leaves no residue, and is more readily available and transportable on the Eastern Front than other chemical cooling fluids.

Since no advance preparations had been made last year to meet such weather conditions, German equipment became unusable, or usable only with great difficulty in many sectors. This experience, plus study and improvement of Russian methods and apparatus, have enabled German engineers to make the following adjustments:

(a) German batteries are too small for eastern winter conditions, and in fact electric starting becomes impossible at -30 degrees Centigrade. Since it is impossible to replace batteries, the use of other starting equipment has become necessary. Heating devices for batteries for ordinary operation have been installed in the form of small benzine lamps in closed battery compartments.

(b) Heavy motors, chilled by cold and steady penetrating wind, are impossible to start without preheating the cooling fluid and oil. This was done last winter by hot-air heating devices improvised on the spot, as well as by draining and warming the cooling fluid. On the other hand, many Soviet heavy motors were equipped with built-in auxiliary starting motors, which, after running about 30 minutes and heating the cooling fluid were able to start the main motor. Germany has adopted an improved version of this Soviet development for use on new equipment.

(c) Germany's main desire was to develop a method whereby heavy motors could be started almost immediately. This requires heating of both cooling fluid and oil before starting. The Russian auxiliary motor has been refined and improved by the addition of an oil-line break-valve to the water line, which enables the heating of both oil and fluid within a very few minutes operation, and thus the main motor can be started in but a fraction of the time required by the original Russian equipment. This improvement is stated to operate most satisfactorily.

(d) With special fuel, the Otto motored equipment can still make use of electric starting apparatus.

(e) Diesel oil makes most satisfactory cooling fluid for winter use in all motorized equipment including that started mechanically or by hand.

SECTION II

SOME EXAMPLES OF KATAKANA (PHONETIC JAPANESE) USED IN COMMUNICATIONS

SOME EXAMPLES OF KATAKANA (PHONETIC JAPANESE) USED IN COMMUNICATIONS

This article is presented for the purpose of clarifying some of the mystery in which, to the layman, the Japanese language is shrouded. Also, it is to be hoped that it will stimulate some interest in the language, especially on the part of communications personnel.

It must be pointed out that there exist no short cuts enabling one to acquire a comprehensive knowledge of this language. Years of unremitting labor are required to master even the fundamentals of writing Japanese kanji (the classic language, which is basically Chinese); however, kana, or phonetic Japanese writing, can be learned in a short time. Communications personnel may, with practice, intercept and transcribe some portions of coded messages which use kana.

a. The Japanese Written Language

(1) Chinese Characters (Kanji)

It was not until the fourth or fifth century of the Christian era that the Japanese felt the need of putting down their thoughts in writing. They had no alphabet, and since their only intercourse with the then known world was with China to the west, they proceeded to borrow, along with many other things, their writing system from that country.

The Chinese writing system is about as difficult a thing to learn or to use as man's mind has ever invented. It started out being a sort of picture language with each word represented by a simplified picture. This system was all right for words like "horse" or "fish," words that could be drawn, but it would not do for more abstract words like "duty," "courage," or "honesty." Obviously, the writing system had to develop far beyond simple pictures, which it did more than 3,000 years ago. But Chinese writing never lost some of its original pictorial quality. There still is one symbol, if not picture, for each word. As a result, there are thousands of symbols, or characters, as they are usually called, in use today in China.

The Chinese system was not a handy one for the Japanese to borrow, but it was all they knew. They had to supplement it with other written signs (kana), developed by themselves, which showed sounds, the way our alphabet does, and not ideas, the way the Chinese characters do. But even after inventing these phonetic writing systems, they still kept to the Chinese characters. They were pronounced quite differently in Japan than in China, because the two spoken languages are not at all alike, but still they represented the same idea. Consequently, most Chinese words can be read and understood by Japanese, and many Japanese words can be read and understood by Chinese. This is not true for pronunciation.

(2) Phonetic Characters (Kana: Katakana and Hiragana)

In katakana and hiragana each character represents a sound, but, unlike English letters, each is made up of a consonant followed by a vowel, i.e., ka, ki,

etc. Exceptions are the vowels a, e, i, o, u, and the consonant n. The katakana consists of 50 somewhat angular symbols which,apart from their use on aircraft, are used by the Japanese mainly for transcribing foreign sounds, and in notices, official documents, telegrams, ships' names, etc. Inscriptions in katakana are usually written from the right, either vertically or horizontally, but on occasions are written from left to right as in English. The hiragana syllabary compares with katakana as our script letters (a) compare with block printing (A). It also consists of 50 forms, but they are cursive in shape and are used in writing letters, in some newspapers, etc. These characters are seldom used for aircraft markings or for depicting ships' names.

In writing out the kana sounds in our alphabet, the following rules are invariably used.

a	ア	as in father
i	イ	as in machine
u	ウ	as oo in loot
e	エ	as a in hay
o	オ	as in oh

A table of the characters used in the katakana syllabary follows:

ア a	カ ka	サ sa	タ ta	ナ na	ハ ha	マ ma	ヤ ya	ラ ra	ワ wa	
イ i	キ ki	シ shi	チ chi	ニ ni	ヒ hi	ミ mi	イ i	リ ri	ヰ (w)i	
ウ u	ク ku	ス su	ツ tsu	ヌ nu	フ fu	ム mu	ユ yu	ル ru	ウ u	ン n
エ e	ケ ke	セ se	テ te	ネ ne	ヘ he	メ me	エ (y) e	レ re	ヱ (w)e	
オ o	コ ko	ソ so	ト to	ノ no	ホ ho	モ mo	ヨ yo	ロ ro	ヲ wo	

Sometimes katakana symbols are used with Japanese numerals and the result is confusing. The katakana for se (セ) and for ha (ハ) look confusingly like the numerals shichi (七) seven, and hachi (八), eight.

0	〇	rei
1	一	ichi
2	二	ni
3	三	san
4	四	shi
5	五	go
6	六	roku
7	七	shichi
8	八	hachi
9	九	ku
10	十	ju (to)

Exceptions: By placing two dots called nigori to the right of the character, a hardened and slightly different consonant sound is produced. The ha column becomes ba, bi, bu, be, bo; the ta column, da, ji, zu, de, do; the sa column, za, ji, zu, ze, zo; the ka column, ga, gi, gu, ge, go. Thus カ (ka) becomes ガ (ga), etc. A small circle (called hannigori) on the right side of the characters alters the reading to a softer sound. For instance, if placed on the right hand side of the ha column, ha (ハ) becomes パ and represents the sound pa. Hi (ヒ) becomes pi (ピ), etc.

b. Application of Katakana to Aircraft

As most Japanese aircraft are marked with characters from the katakana syllabary, it is essential that intelligence officers should have some knowledge of the characters used. In aircraft markings, the katakana syllabary is mainly used; therefore, should a float plane crash or be sighted bearing the under-mentioned markings -

ナ ガ ラ ー

upon referring to the katakana syllabary it would be observed that the first symbol represented the sound na, the second ga, and the third ra; the assembled syllables give "Nagara," the name of a Japanese cruiser. It would, therefore, be established that the float plane was from this cruiser, and that the cruiser was probably in the vicinity. The dash after the character for ra simply

indicates a prolonged sound.

c. Maps and Mapping

Since katakana is phonetic, the Japanese use this syllabary to represent most foreign place names except common geographical names which are written in kanji. This fact makes it possible, with a knowledge of katakana, to read most Japanese maps excepting those of either Japan or China. The following are examples of geographical names written in katakana.

Katakana	Romaji or Romanization	English
ブリスベン	(Bu-ri-su-be-n)	Brisbane
ソロモンス	(So-ro-mo-n-su)	Solomons
カーペンタリヤ	(Ka-pe-n-ta-ri-ya)	Carpentaria

An interesting example of the use of katakana in connection with Japanese maps recently came to light in the discovery of some maps together with a canvas bag labelled in Japanese "Reconnaissance Satchel," containing documents and found floating on the sea near the place of crash of a Japanese heavy bomber in the Southwest Pacific area.

A few days later, a mutilated body was washed ashore at about the same place, on which a small diary and note-book and other documents were found. The documents on the body established the identity and the rank of the man, who was a Naval Shosa - i.e., Squadron Leader or Lieutenant Commander. It is also clear from the documents that he had been a Hikocho - i.e., Flying Leader of a Naval Air Group, up to April 1, 1942, when he became attached to an Air Group.

One of the maps is inscribed Hikocho in one place, and in equivalent symbols on another part of the map. This suggests that the maps were almost certainly in the custody of this man.

One of the maps had written on it the name of a flight sergeant whose card was found among the documents in the reconnaissance satchel. It appears, therefore, that the Hikocho was responsible for the maps and all the documents it contained.

Among the maps were:

1 Naval Air Headquarters secret map,
5 Hydrographic section maps,
3 Naval air navigation charts,
4 Hydrographic survey charts.

The following general points of interest are disclosed by the maps:

(a) The Japanese had a series of secret maps, covering the eastern part of New Guinea and the Solomon Islands. One captured secret map shows that the Japanese had considerable knowledge of "secret" information about a certain island.

(b) One map gives detailed information of airdromes, anchorages, buildings, radio stations, gun emplacements, repair facilities, the numbers and types of inhabitants, and the availability of gas, food, and water in a certain South Pacific area.

(c) For the purpose of reference, several of the maps are gridded in pencil. The grid lines are drawn from north to south and from east to west at intervals of 20', and each interval from north to south and from east to west is marked with katakana syllables, sometimes with a pair of syllables. The katakana syllables appear to follow a sequence which sometimes corresponds to the sequence in which the katakana characters appear in the Japanese syllabary given above, and sometimes follow the sequence in which they are found in a well-known Japanese poem called the "Iroha song." The poem includes all the katakana syllables. To say that a man knows his Iroha uta is to say that he knows his ABC's.

The Katakana Syllabary in the Iroha uta arrangement follows. The characters are given here in sequence as they occur in the poem.

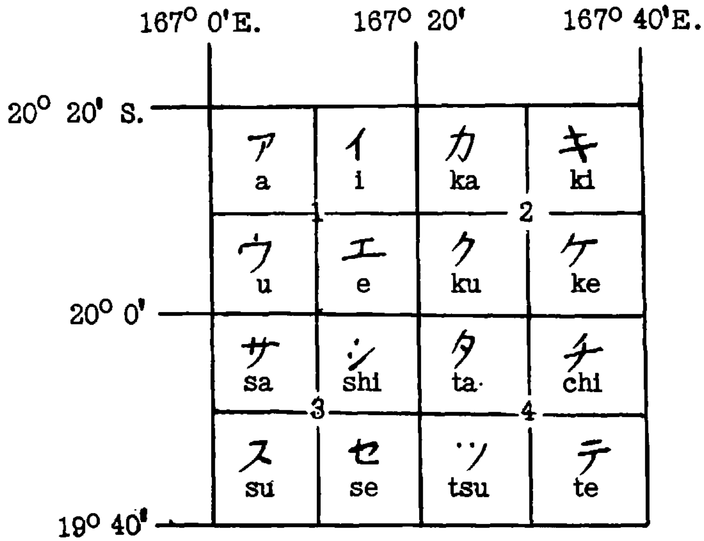
The first row of characters in each column is the katakana; the second row is Romaji (Japanese for Roman letters); and the third row is the code, dot and dash equivalents.

イ	i	·—	ル	ru	—·——	ナ	na	·—·
ロ	ro	·—·—	ヲ	wo	·———	ラ	ra	···
ハ	ha	—···	ワ	wa	—·—	ム	mu	—
ニ	ni	—·—·	カ	ka	·—··	ウ	u	··—
ホ	ho	—··	ヨ	yo	——	ヰ	wi	·—··—
ヘ	he	·	タ	ta	—·	ノ	no	··——
ト	to	··—··	レ	re	———	オ	o	·—···
チ	chi (ti)	··—·	ソ	so	———·	ク	ku	···—
リ	ri	——·	ツ	tsu (tu)	·——·	ヤ	ya	·——
ヌ	nu	····	ネ	ne	——·—	マ	ma	—··—

ケ	ke	−·−−	キ	ki	−·−··	モ	mo	−··−·
フ	fu	−−··	ユ	yu	−··−−	セ	se	·−−−·
コ	ko	−−−−	メ	me	−···−	ス	su	−−−·−
エ	e	−·−−−	ミ	mi	··−·−	ン	n	·−·−·
テ	te	·−·−−	シ	shi (si)	−−·−·	゛		· (nigori)
ア	a	−−·−−	ヱ	we	·−−··	゜		··−−· (hannigori)
サ	sa	−·−·−	ヒ	hi	−−··−	ー		·−−·− (long sound)

U, we, wi,and o are sometimes omitted from the sequences used; in one case o is used instead of wo. It is not yet apparent when or how the two sequences are used, nor is it clear what the starting point is of each sequence on the maps. It may be that the starting point is an arbitrary one fixed on the map and that the two maps are similarly marked for use on a particular occasion or occasions, one map being left at the base and the other taken into the air for the purpose of reference in communication during a flight.

(d) As stated, the grid intervals cover 20' of latitude and longitude respectively. For the purpose of subdividing these intervals for closer reference, the maps on which the grids are marked contain a key which in one case subdivides 4 of the grid squares into 16, each square being subdivided into 4 smaller ones. In the other instance, the same principle is followed, but the illustration of it covers 16 of the primary grid squares instead of 16 subsidiary squares, the primary squares not having been subdivided for the purpose of the illustration.



The grid map illustrates the employment of katakana as arranged in normal sequence. The same method of marking has been found on other captured maps.

d. Communications in Code

When the kana syllabary is used in radio or telegraphic communications, katakana is habitually employed. It should be remembered that this is the printed or typewritten form, and that the receiver of the message, when transcribing the code, would use hiragana. This corresponds to ordinary penmanship as compared to the typewritten or printed letter.

(1) Kana Code Signals with Morse Equivalents

The following is a list indicating Japanese kana code signals with the Morse equivalents. The last two signals on the list (i, · · , nigori) and (un, · · — — ·, hannigori) are not kana signals, but are used to change the initial consonant of certain kana from the values in column 3 to those of columns 4 or 5. They always follow the kana. For example: — · · · is ha, — · · · · · is ba, — · · · · · — — · is pa. Unless operators are trained in kana reception the above would be copied as follows: — · · · as b, — · · · · · as b i, and — · · · · · — — · as b un.

As previously shown, nigori is indicated in kana characters by the sign (゛) placed to the right of the character, and hannigori by the sign (°) also placed to the right of the character.

	Morse	Kana	Romaji	Nigori	Hannigori
a	· —	イ	i		
aa	· — · —	ロ	ro		
ar	· — · — ·	ン	n		
as	· — · · ·	オ	o		
au	· — · · —	ヰ	wi		
aw	· — · — —	テ デ	te	de	
b	— · · ·	ハ バ パ	ha	ba	pa
bt	— · · · —	メ	me		
d	— · — ·	ニ	ni		
c	— · ·	ホ ボ ポ	ho	bo	po

	Morse	Kana	Romaji	Nigori	Hannigori
dm	–··––	ユ	yu		
dn	–··–·	モ	mo		
e	·	ヘベペ	he	be	pe
f	··–·	チヂ	chi (ti)	ji (di)	
g	––·	リ	ri		
h	····	ヌ	nu		
id	··–··	トド	to	do	
j	·–––	ヲ	(w) o		
k	–·–	ワ	wa		
ka	–·–·–	サザ	sa	za	
ki	–·–··	キギ	ki	gi	
km	–·–––	エ	e		
kn	–·––·	ル	ru		
l	·–··	カガ	ka	ga	
m	––	ヨ	yo		
mk	–––·–	スズ	su	zu	
mm	––––	コゴ	ko	go	
mn	–––·	ソゾ	so	zo	
mr	––·–·	シジ	shi (si)	ji (zi)	
mu	––··–	ヒビピ	hi	bi	pi
mw	––·––	ア	a		
n	–·	タダ	ta	da	
o	–––	レ	re		
p	·––·	ツヅ	tsu (tu)	zu (du)	

	Morse	Kana	Romaji	Nigori	Hannigori
q	– – · –	ネ	ne		
r	· – ·	ナ	na		
s	· · ·	ラ	ra		
t	–	ム	mu		
u	· · –	ウ	u		
ua	· · – · –	ミ	mi		
ut	· · – –	ノ	no		
v	· · · –	ク グ	ku	gu	
w	· – –	ヤ	ya		
wi	· – – · ·	ヱ	(w) e		
wn	· – – – ·	セ ゼ	se	ze	
x	– · · –	マ	ma		
y	– · – –	ケ ゲ	ke	ge	
z	– – · ·	フ ブ プ	fu (hu)	bu	pu
i	· ·	゛	nigori		
un	· · – – ·	゜	hannigori		

(2) <u>Code Signals for Numerals</u>

The following is the list of code signals employed for the transmission of numerals. The normal signals, abbreviated signals, and the romanized rendering of the Japanese sound occasionally used for number representation during communication are listed, as well as Morse and <u>kana</u> equivalents;

	Morse	Kana	Romaji	Normal	Abbreviated	Romanization
n	– ·	タ (一)	ta–1	· – – – –	– ·	hi
z	– – · ·	フ (二)	fu (hu)–2	· · – – –	– – · ·	fu (hu)
s	· · ·	ラ (三)	ra–3	· · · – –	· · ·	mi

	Morse	Kana	Romaji	Normal	Abbreviated	Romanization
m	——	ヨ (四)	yo—4	····—	——	yo
a	·—	イ (五)	i—5	·····	·—	i
t	—	ム (六)	mu—6	—····	—	mu
r	·—·	ナ (七)	na—7	——···	·—·	na
w	·——	ヤ (八)	ya—8	———··	·——	ya
v	···—	ク (九)	ku—9	————·	···—	ku
o	———	レ (〇)	re—0	—————	———	re

(3) Code Signals for Punctuation

Following is a list of auxiliary signals used for punctuation, etc.:

Period	·· ·· ··
Paragraph	·—·—··
Parenthesis (open)	—·——·—
Parenthesis (closed)	·—··—·
Long sound	·——·—
End of message	···—·
Code or abbreviated numerals	——··——
End of part (interrogation)	··——··
End of transmission	···—·—

(4) Abbreviation and Procedure Signals

Following is a list of some of the abbreviations and procedure signals:

	Morse	Kana	Romaji	Meaning
ahr	·—·····—·	イヌナ	i nu na	Here is a message. (I shall continue transmission.)
as	·—···	オ	o	Wait.
asmn	·—···———·	オソ	o so	Send slower.
awk	·—·———·—	テワ	te wa	Switch to telephone.
dq	—··——·—	ホネ	ho ne	Break sign. (Body of message follows.)

	Morse	Kana	Romaji	Meaning
eeeeeee	·······			Error.
e a	··—	ヘイ	he i	Close station.
gt	——·—	リム	ri mu	Government telegram.
gw	——··——	リヤ	ri ya	Will use abbreviations or code.
ar	·—·—·	イナ	i na	No, negative.
k	—·—	ワ	wa	Go ahead.
kas	—·—···	サラ	sa ra	Repeat entire message. (Will repeat.)
lar	·—···—·—·	カン	kan	Readability.
larm	·—···—·—·——	カンヨ	kan yo	Good readability, can read.
larmu	·—···—·—·——··—	カンヒ	kan hi	Poor readability, cannot read.
lart	·—···—·—·—	カンム	kan mu	Cannot hear.
mmar	————·—·—·	コン	kon	Jamming, interference, static.
m	——	ヨ	yo	Local.
rwni	·—··———···	ナセ	na se (na ze)	Why.
r	·—·	ナ	na	Understood, received.
mrmw	——·—·——·——	シア	shi a (si a)	I have traffic.
mrr	——·—··—·	シナ	shi na (si na)	I have no traffic.
ur	··—·—·	ウナ	u na	Urgent.
uy	··——·——	ウケ	u ke	I have a message for you.
ud	··——··	ウホ	u ho	Interrogation.
umm	··—————	ウコ	u ko	Receiver.

	Morse	Kana	Romaji	Meaning
ve	...–.			End of message.
x	–..–	マ	ma	Relay message.
mmr	––––.–.	ヨシ	yo shi (yo si)	Yes, affirmative.
zw	––..–––	フヤ	fu ya (hu ya)	Transmission not clear.
zz	––..––..	フフ	fu fu (hu hu)	Code signal is not clear.

(5) Airman's Code of Abbreviations

The following is a list of the Japanese airman's code of two-syllable abbreviations of military terms. Each abbreviation requires exactly two Japanese Morse signs. The code words Hara and Ware are substitutions and such words as Naru and Yuku are given arbitrary meanings. The list dates from September 1939, but it is believed to be still in common use.

Full Expression	Abbreviation	Katakana	Equivalent	Code		Translation
Gun	kun	クン	ku n	...–	.–.–.	army
Shidan	shita	シタ	shi ta	––.–.	–.	division
Ryodan	riyo	リヨ	ri yo	––.	––	brigade
Rentai	ren	レン	re n	–––	.–.–.	regiment
Daitai	tai	タイ	ta i	–.	.–	battalion
Chutai	chu	チウ	chi u	..–.	..–	company
Shireibu	shire	シレ	shi re	––.–.	–––	headquarters
Hohei	hohe	ホヘ	ho he	–..	.	infantry
Yaho	yaho	ヤホ	ya ho	.––	–..	field artillery
Juho	shiho	シホ	shi ho	––.–.	–..	heavy (med) artillery
Kihei	kihe	キヘ	ki he	–.–..	.	cavalry
Hohei	hou	ホウ	ho u	–..	..–	artillery

Full Expression	Abbreviation	Katakana	Equivalent	Code	Translation
Koshaho	koho	コホ	ko ho	---- -..	AA artillery
Shicho	shichi	シチ	shi chi	--.-. ..-.	transport
Kikanju	kika	キカ	ki ka	-.-.. .-..	machine gun
Hikoki	Hiko	ヒコ	hi ko	--..- ----	aircraft
Yugun	ware	ワレ	wa re	-.- ---	our troops
Teki	teki	テキ	te ki	.-.-- -.-..	enemy
Uyokutai	uyo	ウヨ	u yo	..- --	right wing
Chuotai	chiwo	チヲ	chi wo	..-. .---	center
sayokutai	sayo	サヨ	sa yo	-.-.- --	left wing
Yobitai	yohi	ヨヒ	yo hi	-- --..-	reserves
Daiissen	ise	イセ	i se	.- .---.	first line
Zenei	see	セエ	se e	.---. -.---	advance guard
Koei	koe	コエ	ko e	---- -.---	rear guard
Hontai	hon	ホン	ho n	-.. .-.-.	main body
Zenpei	sen	セン	se n	.---. .-.-.	vanguard
Kohei	kou	コウ	ko u	---- ..-	rear party
Sento	seto	セト	se to	.---. ..-..	head
Kobi	kohi	コヒ	ko hi	---- --..-	extreme rear
Shomen	men	メン	me n	-...- .-.-.	front (in meters)
Jucho	chiyo	チヨ シヨ	chi yo shi yo	..-. -- --.-. --	depth (in meters)
Shuryoku	shiyu	シユ	shi yu	--.-. -..--	main force
Ichibu	ichi	イチ	i chi	.- ..-.	part, partial
Shugo	shiu	シウ	shi u	--.-. ..-	assembly, concentration

Full Expression	Abbreviation	Katakana	Equivalent	Code		Translation
Tenkai	ten	テン	te n	·–·––	·–·–·	deployment
Zenshin	susu	スス	su su	–––·–	–––·–	advance
Teishi	toma	トマ	to ma	··–··	–··–	halt
Taikyaku	hiku	ヒク	hi ku	––··–	···–	retreat
Jinchisenryo	chin	チン	chi n	··–·	·–·–·	occupation of a position
Naru	naru	ナル	na ru	·–·	–·––·	preparations for attack completed
Naranai	nara	ナラ	na ra	·–·	···	preparations for attack not complete
Yuku	yuku	ユク	yu ku	–··––	···–	attack making progress
Yuri	yuri	ユリ	yu ri	–··––	––·	fighting developing favorably
Totsugeki	totsu	トツ	to tsu	··–··	·––·	charge
Tsuigeki	tsui	ツイ	tsu i	·––·	·–	pursuit making progress
Furi	furi	フリ	fu ri	––··	––·	situation unfavorable
Soshi	soshi	ソシ	so shi	–––·	––·–·	have been checked
Toppa	toha	トハ	to ha	··–··	–···	break through (at....)
Horu	horu	ホル	ho ru	–··	–·––·	field work is continuing
Kuru ya	kiya	キヤ	ki ya	–·–··	·––	....(locality) appears to be preparing for attack
Teisatsu	tei	テイ	te i	·–·––	·–	state of ....(locality) and....(unit) is to be investigated and reported upon
Meirei	mei	メイ	me i	–··––	·–	issue orders to...(unit)

Full Expression	Abbreviation	Katakana	Equivalent	Code		Translation
Sampeigo	san	サン	sa n	—·—·—	·—·—·	fire trench
Hoheijinchi	hochi	ホチ	ho chi	—··	··—·	artillery positions
Tetsujomo	tetsu	テツ	te tsu	·—·——	·——·	barbed-wire entanglements
Hikojo	hara	ハラ	ha ra	—···—	···	airdrome
Higashi	hika	ヒカ	hi ka	——··	·—··	east of....(locality)
Nishi	nishi	ニシ	ni shi	—·—·	——·—·	west of....(locality)
Minami	mina	ミナ	mi na	··—·—	·—·	south of....(locality)
Kita	kita	キタ	ki ta	—·—··	—·	north of....(locality)
Mae	mae	マエ	ma e	—··—	—·———	in front of....(locality)
Ato	ato	アト	a to	——·——	··—··	behind....(locality)
Muko	kau	カウ	ka u	·—··	··—	towards....(locality)
Wataru	wata	ワタ	wa ta	—·—	—·	from.... to....
Migi	miki	ミキ	mi ki	··—·—	—·—··	right
Hidari	hita	ヒタ	hi ta	——··—	—·	left
Gozen	ze	ゼ	ze	·———·	··	a.m.
Gogo	go	ゴ	go	————	··	p.m.

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TACTICAL AND TECHNICAL TRENDS

No. 14

December 17, 1942

Prepared for

ARMY GROUND AND AIR FORCES AND SERVICES OF SUPPLY

by

MILITARY INTELLIGENCE SERVICE, WAR DEPARTMENT

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CONTENTS

SECTION I

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All correspondence pertaining to the bulletin should be addressed to the Dissemination Group, M.I.S.

Other publications of the Military Intelligence Service include:

<u>Intelligence Bulletins</u>, published monthly.

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<u>Special Series</u>, covering miscellaneous subjects, of which at least one is issued each month, the most recent being "Artillery in the Desert" and "Enemy Air-Borne Forces."

<u>Campaign Studies</u>, the most recent being "Japanese Land Operations, December 8, 1941 to June 8, 1942."

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SECTION I

1. ME-210 FIGHTER--DIVE-BOMBER

The new Messerschmitt 210 (shown in the accompanying sketches) was first believed to be an improved model of the Me-110, but subsequent developments have shown it to be an entirely new long-range fighter and dive-bomber.

The pilot and a radio operator, who also acts as a rear gunner, comprise the crew.

Except for size, the Me-210 bears little resemblance to the Me-110 fighter-bomber. It is a twin-engined, low-wing, all-metal monoplane with a single fin and rudder. The noticeable deep fuselage tapers to a very slim section near the tail. The wings have a straight taper with rounded detachable tips. As the drawings indicate, the cabin enclosure is very humped and ends approximately at the trailing edges of the wings. The bomb compartment, which has a normal capacity of 4,400 pounds, is in and under the cabin forward of the leading edge of the wing. The single-strut undercarriage and the tail wheel are retractable.

Slots are fitted to the leading edges of the wings, and the slotted ailerons are equipped with trimming tabs. Strips are also fitted to the trailing edges of the ailerons for trim adjustment on the ground. The wing flaps are of the split type.

The venetian-blind-type dive brakes are located outboard of the engines, immediately forward of the coolant radiators, and are fitted to both upper and lower surfaces of the wings.

The comparatively large-span horizontal stabilizer is not adjustable, and the elevators are fitted with trimming tabs.

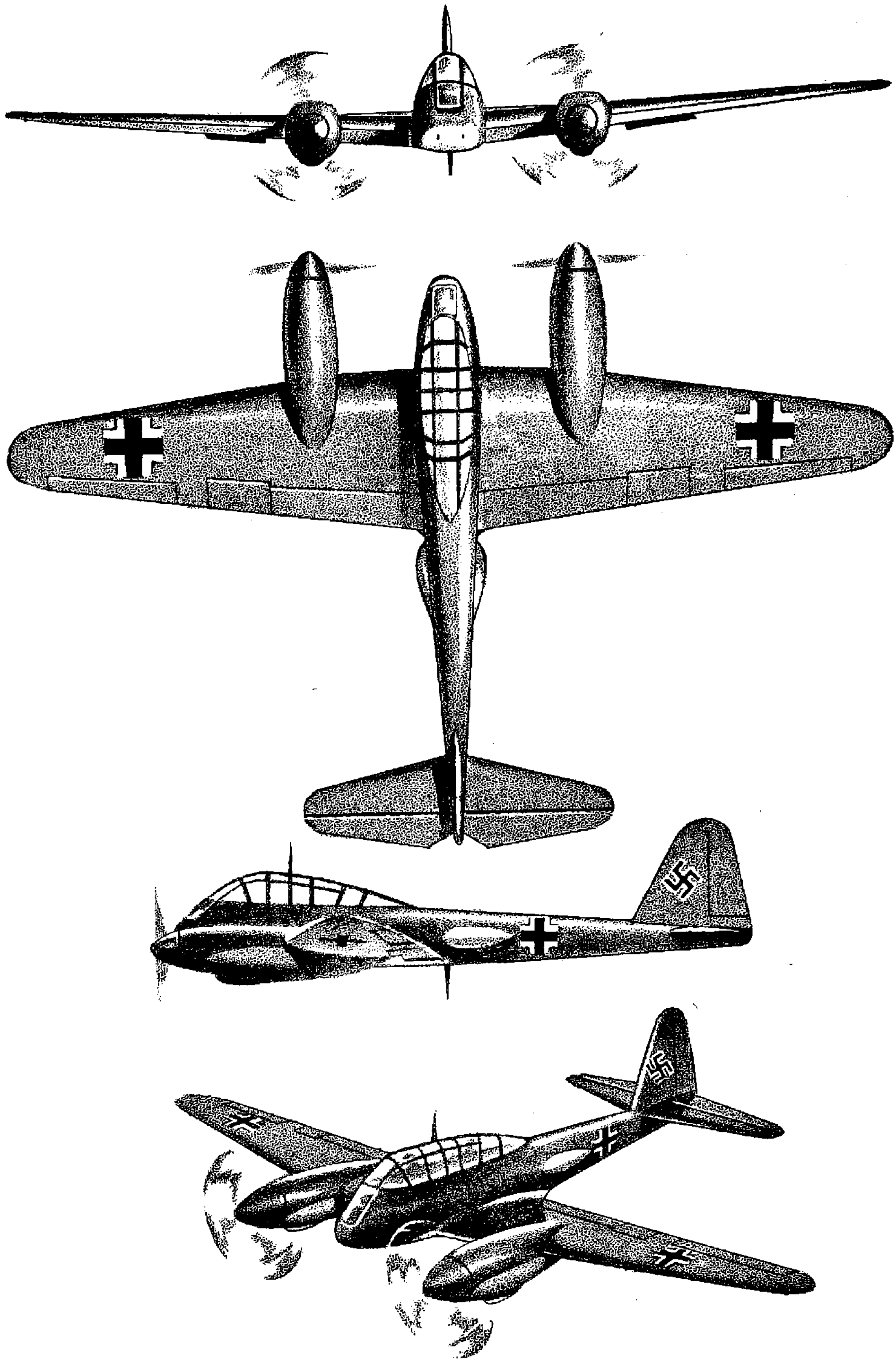
The Me-210 has comprehensive armor protection and is believed to be one of the best-armored planes of its kind.

The airplane is armed with five or six guns.

The fixed forward armament is mounted in the nose and is believed to consist of two 20-mm cannon flanked on each side by one 7.9-mm machine gun.

The rear or lateral armament comprises two 13-mm machine guns 131, one mounted on either side of a barbette which joins the two sides of the fuselage amidships. The guns fire through blisters on the sides of the fuselage aft of the trailing edges of the wings. The entire barbette, including guns and fairings, rotates in elevation, both guns moving in unison. For horizontal movement, one gun traverses the field of fire while the other gun is locked nearly parallel with the fuselage. However, both guns can fire together when in a nearly parallel position.

The rear gunner aims through a heavy bulletproof glass screen and controls the barbette through a handle which moves in elevation and in traverse. The motion of the handle is torque-amplified by an electrically driven mechanism



Messerschmitt 210

which drives the barbette through direct gearing. The blisters attached outside of the fuselage turn with the barbette. They have slots in which the guns move in traverse.

Two standard reflector-type sights are used, one on either side of the fuselage. Corrections are made to the line of sight by a mechanical vector device, the plane's speed being set manually.

This whole arrangement of the blister gun-mountings is of considerable interest as the first known enemy attempt to produce a power-controlled armament suitable for small and fast aircraft.

2. GERMAN GLIDERS AND GLIDERBORNE TROOPS

a. Organization of Gliderborne Troops

Gliderborne troops constitute one of the two German Air Force components operating under the Fliegerkorps XI. They are known as Sturmtruppen (assault troops) and are organized into a Sturmregiment. Although technically airlanding units, they must not be confused with the airlanding Army troops, which are infantry units.

Troops transported by gliders function in close conjunction with parachute troops and the Army airlanding detachments. In the general pattern of operations, they precede the parachute troops and, by their noiseless approach, utilize to the fullest the element of surprise. Their mission is to neutralize antiaircraft and other defenses, and to disrupt all communication systems. They thus prepare the way for the parachutists who seize landing ground for the transports bearing the airlanding Army troops.

The assault regiment has a full strength of almost 2,000 men and is organized into 4 battalions having a total of 14 companies. Each of the first 3 battalions is broken down into a headquarters and signal unit, a heavy weapons company, and 3 rifle companies of 120 men each. A rifle company consists of 4 platoons, plus a headquarters and signal unit. Each platoon is divided into 3 sections of 10 men each. The fourth battalion includes a headquarters unit, a signal section, and 2 companies, infantry-gun and antitank.

The DFS-230 gliders, in which the assault troops are normally carried, are organized into a special air transport unit known as the Luftlandung Geschwader, the smallest operational unit of which is a Kette of 3 gliders. Each glider carries a complement of 10 men, which is a section of a platoon. Three flights or Ketten make up a Gruppe. The Geschwader is, therefore, composed of 4 Gruppen with a total of 192 gliders and can transport the entire Sturmregiment of approximately 2,000 men.

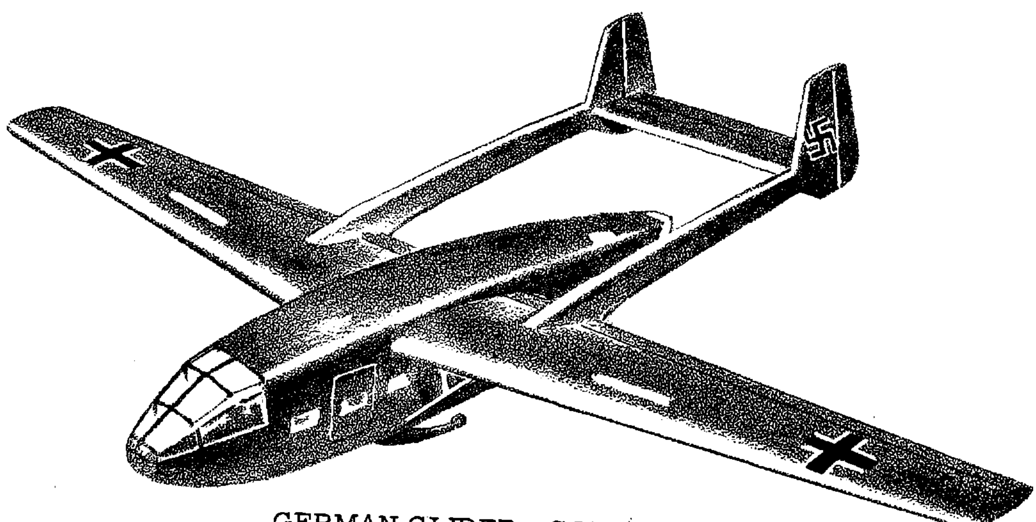
b. Training

Glider pilots generally have had previous experience in civilian glider flying, although this does not qualify them for handling a freight-carrying glider. A 6 weeks' course in gliding is given in special training schools, particular stress being placed on spot landings. Training on large gliders is conducted within the glider unit itself. The troops carried by a glider are graduate parachutists; however, they do not normally wear parachutes in gliderborne operations. It is debatable that they parachuted from gliders over Crete as has been reported.

Training gliders are believed to fall within three classes according to wing span. The "A" class glider has a wing of high aspect ratio with 55- to 60-foot span and usually a very short nose. It is possible that some gliders in this class may be high-performance sailplanes. Gliders in the "B" or intermediary class, having a span of 35 to 50 feet, are probably the most widely used. The "C" class gliders, with a span of 33 to 35 feet, are believed to be used for primary training.

c. Types of Gliders

Up to the present time the DFS-230 mentioned above is the only troop-carrying glider that has been identified as carrying assault troops during operations. The Gotha-242 (see following sketch), which has often been referred to as one of the principal troop transport gliders, is used almost entirely for carrying freight. This high-wing, dual-controlled glider is reported, however, to be capable of carrying 21 fully equipped men in addition to 2 pilots.



GERMAN GLIDER--GOTHA-242

The Merseburg, which has been mentioned as a tank-carrying glider, has been estimated to accommodate 40 to 50 men, while the Goliath is veritably the giant glider that its name implies. This twin-fuselage glider is believed to have a wing span of 270 feet and a wing area of 7,500 square feet, and to carry 17 to 20 tons or 140 fully equipped men, 70 in each fuselage. These gliders are in a more or less experimental stage and are therefore not considered for the purpose of this discussion as a part of the Geschwader organization.

The DFS-230 used in the Cretan campaign is a high-wing monoplane with a wing span of 71 feet 5 inches and a length of approximately 36 feet. It has fabric-covered wings and a fuselage of steel tubular construction. The wheels can be jettisoned after the take-off, and a landing is effected on a central skid. The empty weight of this glider, fixed equipment included, is approximately 2,200 pounds, and the (tare) fully loaded weight 4,600 pounds. Weight varies according to the assignment involved; a useful load is probably about 2,400 pounds.

This glider will carry nine fully equipped men and one pilot. Seats are arranged in a single line on a boom running along the center of the fuselage, six facing forward and four backward. The rear seats are detachable in case more space is needed for freight. A 24-volt storage battery installed in the nose of the glider furnishes power for navigation, cabin, and landing lights. A fixed light machine gun (LMG-34) is believed to be attached externally to the starboard side of the fuselage and fired by the man in the seat behind the pilot. Instruments on the panel of the DFS-230 include altimeter, compass, and air-speed, rate-of-climb, and turn-and-bank indicators.

The DFS-230 is ordinarily towed by a Ju-52 aircraft, which normally flies empty. Towing planes usually fly in a Kette; but when two or three gliders are towed, each is attached directly to the tug in V-formation. The glider is towed by means of a rope or a steel cable attached to a hook in the tail of the aircraft and fitted with a quick-release mechanism. The length of the towing line depends on the airfield space available; the longer the rope the easier the handling. A multiple tug arrangement probably would be necessary to tow a glider the size of the Goliath or the Merseburg. Three or four Me-110's or three Ju-52's might give a reasonable performance, although this would be a difficult operation.

d. Glider Operations

Gliders do not require large landing areas, runways being desirable but not essential. The landing run of a DFS-230 is said to have been shortened by wrapping barbed wire around the skids. Flaps are used to steepen the angle of the glide. In case of Me-110's being used as tugs, rocket-assisted take-off may be necessary when using airdromes with runways less than 2,000 feet.

The range of operations of a glider is obviously dependent on the range of the towing aircraft. The total range for the Ju-52 with 530 gallons of fuel in still-air conditions when towing one DFS-230 is about 780 miles, or 600 miles for three gliders. This will allow an approximate radius of action of 250 miles.

With extra fuel a Ju-52 is reported to be able to tow a DFS-230 more than 1,000 miles.

The distances which gliders can cover after the release vary according to altitude of release, direction and force of wind relative to line of flight, navigation errors, and evasive action. The gliding distance for the DFS-230 has been calculated in the ratio of 1 to 16 in still air, i.e. for every foot of descent, the glider theoretically covers 16 feet measured horizontally. In Crete, gliders are believed to have been released at not more than 2 to 5 miles from shore and at altitudes not more than 5,000 feet, permitting a gliding range of 8 to 10 miles. Normally gliders are never released directly over the objective but at a sufficient distance so that towing aircraft need not fly over the point of attack.

While the Germans were apparently successful in glider operations in Belgium,* the glider performance in Crete resulted in many casualties due to premature release, short turns, navigation errors, and rocky terrain. The troop glider, like all aircraft, is extremely vulnerable to small-arms fire when gliding low near ground defenses. Although it is not clear how light tanks if brought by air would be employed, it is believed that gliderborne units are not equipped to follow up tank advance, at least in the early stages. They lack motor transport and are, therefore, not mobile. Darkness is also a deterrent to gliderborne operations. So far as is known, glider attacks have been limited to dawn and dusk operations.

When a glider attack is made a part of large-scale airborne operations, it is important that glider airdromes should not be located too near the objective, since concentrations of aircraft are conspicuous and likely to receive attention from hostile aircraft before the units get on their way. It is, on the other hand, impracticable to conduct glider attacks from airdromes more than 200 miles away. Over longer distances, decisions at the rear take progressively longer to affect the action and thus make operation more difficult for the pilots. Furthermore, it is desirable that troops going into action not be kept seated in aircraft for longer than 2 or 3 hours, the time required for the 200-mile flight. Finally, since dawn is the usual time of attack, and such attacks cannot be made unless the planes take off at night, it would follow that they should depart early in the day and not spend too much time on the journey.

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* In the comparatively small (but important) operation at Fort Eben Emael.

3. GERMAN MOBILE AUXILIARY DIRECTOR

The mobility and tactical efficiency of heavy antiaircraft units are, at least to some extent, limited by their elaborate fire-control equipment. The Germans have designed an auxiliary director (reported to be the Kommando-Hilsgerät 35) as an alternative to the standard director (Kommandogerät 36) for occasions when the latter is out of action or otherwise not available. The auxiliary director is also reported to be used for fire control against ground targets (see Tactical and Technical Trends, No. 6, p. 8).

The auxiliary director weighs about 400 pounds and does not need any electrical equipment. Heights or ranges are obtained from a separate 13-foot stereoscopic height- and rangefinder, and passed orally to the director. In the standard director, the rangefinder is incorporated. This simplification has, of course, only been introduced at the expense of accuracy in the data provided.

The director works on simple angular rates ignoring the meaning factor. By following the target continuously in line and elevation, and by setting in range (or height) continuously, deflections in terms of rate of change are multiplied by present time of flight. It is claimed that these approximations counterbalance each other, since with an approaching target, rates of change of bearing and angle of sight will be too small, while time of flight will be too great, thus giving a close approximation. At the crossing point, when the error is greatest, it is considered that errors so caused will be within the 50 percent zone of fire.

The fuze setting is obtained from the rate of change and the present range. The data are corrected for abnormal ballistic conditions, dead time, and drift and transmitted by telephone to the guns. The dead time allowed is 3 seconds. No allowance is made for wind and displacement.

The setting-in of range is interesting, in that a target not flying at a constant height can be engaged. Height, not range, is set in when the target is flying at a constant height.

A crew of four are employed on the rangefinder, and distribution of duties on the director is as follows:

No. 5 Layer for azimuth
No. 6 Layer for elevation
No. 7 Range setter
No. 8 Lateral rate-setter
No. 9 Vertical rate-setter
No. 10 Range rate-setter
No. 11 Reader of azimuth to guns
No. 12 Reader of elevation to guns
No. 13 Reader of fuze setting to guns

4. GERMAN GUN-FIRE AGAINST AIRCRAFT

The Germans apparently do not resort to desultory fire against enemy aircraft but "turn on the tap" by using every weapon capable of pointing skywards, including heavy and light AA guns, machine guns, automatic rifles, rifles, and pistols. These are fired to the limit whenever an attempt is made to attack one of their columns. Bombing a German column has often proved to be a dangerous and costly matter, as was evidenced both in the battles of France and in the fighting in Libya. This information, reported by a British air officer, emphasized in addition the effectiveness of the German 20-mm AA cannon which is distributed throughout all columns.

This air officer suggests that troops should not feel disappointed if, despite their fire, an enemy plane gets away apparently unscathed. Few planes vigorously attacked escape without some damage. Some are seriously shot up. Not only must all serious damage be repaired, parts replaced, and sometimes even entire engines replaced, but every bullet hole must be patched, and a thorough, painstaking check made of the aircraft to discover hidden spots which may have been hit. All this takes time and requires labor, with the result that the aircraft is grounded during the time needed for inspection, repair, and subsequent re-check. All of these points should be remembered. Consequently, the need for an all-out attempt to inflict damage on attacking aircraft with the weapons available should be of paramount importance.

This same British officer, when asked if there was any difficulty in determining the nationality of columns of troops in the desert, said: "No. All columns of troops in the desert look alike from the air, and both friend and foe shoot at you; but their nationality is immediately apparent. If they are our own, the fire is disturbing, and one fires the identification signal; if they are German, the fire is terrifying, of unbelievable volume and intensity, and leaves no doubt as to the identity of the column."

ANTITANK

5. TACTICAL USE OF GERMAN 20-MM DUAL-PURPOSE GUN

The Germans are firm believers in the dual-purpose antiaircraft-antitank gun. German Fla-Bataillone (independent antiaircraft battalions which are organic to the infantry) are equipped with such a weapon, the 20-mm self-propelled gun (for details, see this publication No. 5, p. 14). What follows is adapted from what appears to be the notes of a commander of a Fla platoon; note the importance attached to ground targets.

a. Ground Targets

The 20-mm gun on a self-propelled mount combines the fire power and mobility of an AA gun with the accuracy and penetration of an AT gun. Its disadvantage is that it is insufficiently armored, and this fault must be offset by good use of ground and fire control. The smallest unit in battle is the two-gun section. Use of single guns is exceptional.

As in all land operations, ground observation is most important. Every spare man must be employed on this, and must be made personally ambitious to spot enemy targets. Owing to the amazing accuracy of the gun "it is possible to say that when the enemy has once been spotted, he no longer is an enemy."

b. Protection during Deployment

During deployment, platoons usually take over protection against air or land attack. Guns must be sited so that attacking aircraft can be engaged from reverse slopes, while approaching ground targets can be brought under fire as quickly as possible by moving up the slope to a forward position.

c. The Attack

The Fla platoon supports the advance of the infantry and other arms. For this purpose it should be placed on the flank to enable its range to be fully utilized without endangering friendly troops. A hundred yards more or less to the flank hardly affects the efficacy of the 20-mm gun.

During operations the following are the only men on the vehicle: driver, gun commander, No. 1, and No. 4. The gun commander often has to dismount to reconnoiter the terrain or a position, when No. 3 takes his place. The other men, including ammunition handlers, give protection and observe to the flanks of the gun. If there is no mine-spotting section available, the ammunition handlers must cover the terrain to be traversed.

The platoon or section commander follows directly behind the attacking infantry or the pioneer assault detachment with his runners. He reconnoiters for good positions and opportunities for the employment of the gun. Signalling by means of the machine-gun company's number code has proved effective.

The guns usually approach their targets backwards, and use all folds in the ground and other cover.

d. Firing

Good fire discipline including good observation is of the greatest value. This needs practice and will be made easier by cooperation with the attacking troops and the various observation posts. Zones of observation must be laid down. Telescopes and rangefinders will be used to the full.

e. Movement

Changes of position must be made rapidly. Movement parallel to the front must be avoided if possible. The guns will advance by bounds. If there is only slight opposition, which can be broken by one section, the other section remains in readiness and then goes forward as the advanced section, while the first gets ready for action again.

When close to the enemy and when breaking into his positions, the guns fire on the move. Thus they force the enemy to take cover, and achieve a strong effect on morale.

f. Defense

When in an assembly area or holding a defensive position, the guns occupy prepared positions under cover. Several alternate positions are prepared, battle outposts are put out, possible targets are spotted, landmarks identified, etc.

g. On the March

On the march, when in the rear or when contact with the enemy is likely, the platoon is disposed as follows:

No. 1 gun--protection to the front and right;
No. 2 gun--protection to the front and left;
No. 3 gun--protection to rear and right;
No. 4 gun--protection to rear and left.

In case of aerial attack, a similar formation will be adopted. Fire will then be opened at the halt on the section commander's orders. Aircraft will only be engaged if they spot or attack German positions, if bridges or observation posts have to be protected, or if the aircraft present an especially good target.

The communications section and unit transport travel with the forward echelon trains of the unit under whose command the platoon has been placed.

h. Tanks

It has been proved that the gun rightly used can put even the heaviest tanks to flight, even if it cannot put them out of action. The most effective range against tanks is under 400 yards. Every effort must be made to attack tanks from the flank.

6. GERMAN TACTICS IN THE DESERT

The support of tanks by the other arms is essential to success of tank operations. German application of this principle is illustrated in the following information on the Axis 1942 spring offensive in North Africa.

Great alertness was shown by the German forces in covering their front with antitank guns when their tanks were halted or stopped to refuel, and in protecting their flanks at all times with an antitank screen. A threat to the German flanks by tanks was immediately met by the deployment of antitank guns while the German tanks continued their movement. The enemy appears to have a rapid "follow the leader" system of deployment and a system

of visual control by means of colored disk signals.

Every effort was invariably made to draw the fire of the defense, especially the fire of antitank weapons, by the deployment and advance of a few tanks. These tanks advanced, and were then withdrawn, and the enemy concentrated his artillery and mortars on all the defenders' weapons that had disclosed themselves. After a thorough preparation of this kind, the real tank attack was launched.

In at least one instance, a passage through a minefield was cleared for German tanks in this manner: A detachment of tanks advanced to the edge of the minefield and engaged all the defending weapons they could see. Pioneers then dismounted from the tanks and proceeded to clear mines on foot, covered by the fire of the tanks. Tanks that were hit were pulled out by other tanks and then replaced.

7. INCENDIARIES

The following article is a reprint of "Chemical Warfare Intelligence Bulletin 3" emanating from the office of the Chief of Chemical Warfare. It comprises an excellent summary of information on developments in incendiary munitions, and as such would be of interest to readers of Tactical and Technical Trends.

* * *

The past year has seen changes in design, construction, and tactical use of incendiaries on the part of all warring nations. Each of the Axis nations has developed new types of aerial bombs and incendiary munitions, with Germany taking the lead. This bulletin provides information on these changes, with a chart which gives a late compilation of all known types of enemy incendiary bombs.

a. Germany

The outstanding incendiary developed by the Germans during the past 12 months has been a combination of an antipersonnel and incendiary bomb. Using the 1-kilogram (2.2 lbs.) incendiary as a base, they removed the explosive charge from the tail and added a steel extension to the nose, containing a much more powerful charge (at first thought to be TNT but later believed to be a picric acid derivative) and fuze. This change was due to the British having perfected a plan for combatting the regular oil, thermite, or magnesium incendiaries and to the civilian personnel having become thoroughly trained in defense measures.

The effect is essentially as follows: If fire wardens attempted to put out the fire as in the case of ordinary incendiary bombs, the explosive nose -- timed with a fuze to go off in from 1 to 5 or more minutes -- would catch them unawares. In some cases the bomb might break in half and the two portions could roll in different directions; thus, while fighting the incendiary section in one location, the fire warden would be endangered by the explosive portion, possibly lying unnoticed in a dark corner. With a lethal velocity 50 feet from the point of explosion, this new-type bomb has meant a delay of 5 to 7 minutes in effective defense measures.

Another type recently developed contained a canister of small incendiary units scattered by a large high-explosive charge. As the bomb bursts, it throws out about 60 metal containers with a thermite-type filling, and 6 pre-ignited firepots of the magnesium electron type. Immediately thereafter the TNT detonates. The weight of this incendiary bomb (110 lbs.) insures penetration, and the explosive charge (16 pounds of TNT) produces a definite demolition effect, wrecking partitions, doors, ceilings, flooring, etc.

A 50-kilogram (110-pound) bomb, with a filling containing 10 percent rubber and 4 percent phosphorus in an oil gel base, has been used with questionable success as an incendiary agent, phosphorus burns occasionally being inflicted on personnel. Some pieces of gel remain exposed to the air a considerable time without catching fire, while others start smoking and ignite after only a few minutes.

[Initial information on the 3 incendiaries above appeared in Tactical and Technical Trends No. 6, p. 21.]

b. Italy

While to date not actively engaged in any large-scale utilizations of incendiary bombs, the Italians have produced a 1-kilogram type similar to the German, and in addition have developed two new ones. One of these, a 43-pound type, may be mistaken for the Italian 50-kilogram torpedo-type bomb; the other, a 62-kilogram bomb, carries a filling of 54 pounds of thermite.

c. Japan

The chart shows graphically several types of Japanese incendiary bombs which depend mainly on thermite, phosphorus, and oil. This may indicate a magnesium shortage. They have experimented also with the use of parachute-borne incendiaries, with action delayed in some cases up to 6 hours. One type used in the Philippines was made of a pasteboard composition. Stains and odors found near points of explosion indicated that they contained picric or sulphuric acid. However, the incendiary effect was limited.

[See Tactical and Technical Trends No. 12, p. 17 for information on incendiaries dropped on Rangoon by the Japanese.]

Two incendiaries were dropped by an unidentified plane on Mt. Emily, near Brookings, Oregon, in September 1942. Parts and fragments of one were recovered. The fuze had Japanese characters stamped on it; apparently the bomb was 125 to 150 pounds, with a nose of metal twice as thick as the body; it was evidently not a production job, but an adaptation from a mortar shell. Some 35 or 40 triangularly shaped pellets with a round hole in the center of each were recovered. They appeared to be of a hard rubber composition impregnated with particles of magnesium; it is also possible that a thermite mixture was in the bomb. (Note: In some cases this filling is believed to contain additional chemicals and organic materials, which may appear in later type bombs.)

See chart, next page, for other German, Italian, and Japanese incendiary bombs.

Known Types Of Enemy INCENDIARY BOMBS ∴ As Of December 1, 1942

ORIGIN AND SIZE	LENGTH (OVERALL)	DIAMETER	WEIGHT (FILLED)	CASING	FILLING	FUZE	CHARGE	REMARKS
GERMAN-								
1-kg.	14"	2"	2.2-lb.	Mg. Electron	0.2-kg. TH.	(PERCUSSION CAP WITH STRIKER	{¼ lb. TNT or	Aluminum Color. Usually In Cluster of 120.
1-kg. (I.B.E.N.)	20¾"	2"	5 - lb.	Mg. Elec. & Steel	TH. & TNT.	"	Picric Acid	Green.
2-kg.	15"	3"	4.4-lb.	Metallic Mg.	TH.			Similar to British ARP Practice Bomb.
5-kg.	18"	2¾"	10-lb.	" "	"			
10-kg.	22¼"	3¾"	22-lb.	" "	"			
12-kg.	23"	6½"	25-lb.	Mg. Electron	8.5-kg. TH.	D.A.		
50-kg. (B.L.C.)	43"	7¾"	110-lb.	Thin Steel	Al. Powder & TH.	No. 9.	12 lbs. TNT.	
50-kg.	43¼"	8"	75-lb.	Machined Steel	Mg., Gunpowder, TH.	No. 28A.	20 lbs. TNT.	Green Tail & Nose. (Sprengbrand C-50).
50-kg. (S.C. Type)	43"	8"	90-lb.	" "	Benzine 86%, P. 4%, Rubber 10%	No. 25 B	16 lbs. TNT.	Green Nose & Body With Red Band Around Middle. Dark Gray Tail - Yellow Stripes On Cone.
110-kg. (C-250)	64"	14½"	240-lb.	Sheet Steel	50 kg. Oil	ELA Z-26 Pale Green	2 lbs. TNT.	Green (and Red). Nose & Tail Rings Blue. 2 Red Bands
550-kg. (C-500)	65"	18"	460-lb.	Sheet Iron	Oil		H.E. Burster	⅞" Red Band 9.5" & 33" From Nose.
FRENCH-								
1-kg.	14½"	2"	2.2-lL.	Mg. Electron			Gunpowder	Red Body, Green Tail. Conical Tail Assembly - 8 Vanes.
1-kg.	14"	2"	2.2-lb.	" "				" " " " Cylindrical - German Type Tail.
10-kg.	22"	3½"	17.6-lb.	Steel Nose, Mg. Body.	12 Mg. Tubes	Type H		" " " " Sheet Steel Tail.
JAPANESE-								
1-kg. (AP & IB)	10.2"	3"			Red Phosphorus	Detonator	Picric Acid	Black Body, White Tail.
15-kg.					TH. or WP.		Bl. Powder Burster	
50-kg.	40"	7"		⅛" Drawn Steel	Rubber; P. Pellets	No. 97	TNT.	Blue Gray, White and Red Bands.
50-kg.	40"	7.9"	156-lb.	Steel	Electron & TH.	No. 97	Black Powder	Light Gray, Tail Fin Supports Red.
60-kg.	43"	9.5"	132-lb.	Steel Inner Case	TH., Paraffin, Kerosene	No. 97-Nose	Bl. Powder Burster	Blue Gray - Red Band at Tail.
60-kg.	41.6"	9.5"	132-lb.	" " "	Solid Oil & TH.	No. 97	Black Powder	" " - Red Tips of Tail Vanes.
70-kg.			150-lb.	½" Mg. Alloy	TH.			Gray Body, Green Fins, Red Tail Assembly.
ITALIAN-								
1-kg.	7"	2¾"	2.2-lb.		0.8-kg. TH.	K (Tail)		Gray Body - Black Nose.
2-kg.	12½"	2"	5-lb.	Mg. Electron	TH. - Oil	"		" "
20-kg.	34"	6½"	45-lb.	"	TH.	E (Tail)	Al. Powder, Fe. Ox.	" "
62-kg.	47"	10"	136.7-lb.	"	54-lb. TH.	G (Tail)	Mg. Powder	Steel Cap on Nose.
100-kg.	53½"	10¾"	220-lb.			X (Nose)		

Abbreviations:

I.B.- Incendiary Bomb. E.N.- Explosive Nose. A.P. - Anti-Personnel. Mg.- Magnesium. Elec.- Electron. TH.- Thermite. Al. - Aluminum. P.- Phosphorus. WP. - White Phosphorus. H.E.- High Explosive Bl. - Black.

c. Other Incendiary Munitions

(1) Grenades

Under this heading is grouped information regarding frangible grenades ("Molotov Cocktails"), antitank grenades, and similar weapons.

The German "T B" hand-thrown prussic acid grenade is a glass cylinder approximately 4 inches in diameter, packed in sawdust in a cardboard container, and the container packed in sawdust again inside a metal canister.

The Japanese have a similar type, filled with prussic acid, several cases of these grenades having been washed up on the beach in the beginning of the Malayan campaign. As HCN may inflame, it must be considered as an incendiary as well as a toxic agent.

From Russia have come unconfirmed reports of the use by the Germans of incendiaries (frangible grenades dropped from planes?) to set fire to the high grasses of the steppes.

An Italian incendiary grenade, devised for close defensive work against tanks and armored vehicles, consists of a quart of gasoline in a glass bottle fitted with a metal cap. An igniter fuze, match, and wooden handles are attached to the side of the bottle. For distances of 65 feet or more, a safety device is utilized which operates after a long trajectory.

The Japanese developed a grenade in the form of a liquid-filled beer bottle stamped "B Kirin Brewery Co. LTD." The fluid is essentially coal tar. This bottle is equipped with fuze, safety lid, and safety pin.

(2) Shells

The German Schwere Wurfgerät 40, mounted on an armored half-track vehicle for field use, is a weapon for firing both high explosive and incendiary ammunition. The latter is reported to be as follows: weight of projectile, 174 pounds; filling, 11 gallons of oil; markings, green and yellow band. The projectile is reported to be a rocket type, fired electrically, with a range of over 2,000 yards.

[See Tactical and Technical Trends No. 8, p. 28 and No. 12, p. 12 for additional information on this weapon.]

(3) Disks

Samples of incendiary disks, used by the Germans to fire crops, woods, fields, etc, have been examined. They appear to be made of sponge rubber - colored bright yellow - and catch fire spontaneously, forming a black oily substance. Roughly oval in shape, 3/8-inch thick (the largest being 9 by 16 inches and the

smallest 4 by 3 inches), they are harmless when wet, and may be moved in this condition to a safe place where they can dry and burn themselves out.

(4) Tracer Bullets

A 13-mm (0.514-inch) incendiary tracer bullet used by the Italians is similar in appearance to their 13-mm explosive bullet, except that the body is colored blue instead of red.

ENGINEERS

8. JAPANESE CAMOUFLAGE GARMENT

The garment shown in the accompanying sketch was captured in the Solomons area. A number of similar garments were found packed in bales, and in at least one instance, one was found on a Japanese sniper shot out of a palm tree by U.S. marines.

It is made from the shaggy, reddish-brown fiber that grows at the base of the fronds of the coconut palm tree. Sheets of this fiber are sewed together to form the garment.

It can serve as a camouflage garment to be used in areas where there are quantities of coconut palms. It has been used by snipers strapped in among the fronds of palm trees, and it could also be used effectively on the ground under suitable color conditions.

Comment: This type of garment is widely used in Japan as a raincoat. Those made of coconut palm fiber are used by Japanese fishermen, while the Japanese farmer makes his with reeds or rushes.

9. TRAINING OF ENGINEER UNITS

The following remarks on British training problems for engineer units are presented in order to indicate methods of obtaining thorough performance and creating realism in the technical elements of field exercises.

a. Umpiring

In training exercises an unusually large number of umpires are assigned to Division and Corps engineer units. One senior umpire is assigned to each Headquarters and three officer umpires are allotted to each Field Company. In the case of an exercise including large numbers of minor demolitions, a number of noncommissioned officer umpires are added. Each officer is provided with

Japanese Camouflage Garment

his own transportation and also has at least one motorcycle messenger.

Umpires are instructed to give full consideration to technical as well as tactical details of operations. For example, in the case of demolitions, umpires are reminded that in actual combat no large demolition plan ever functions at 100 percent efficiency. Where there appears to be a valid reason to suppose that a demolition might not function (e.g., because of inadequate waterproofing precautions in appropriate cases) the demolition might be ruled a failure or a partial failure.

b. Demolitions

In order to emphasize the selection of explosives available in combat, and their limited quantities, wooden blocks to represent standard charges, sand to represent bulk explosives, packets of gravel to represent special types of explosive charges, and varied kinds of cord and string to represent primacord, safety fuze, and instantaneous fuze are prepared and carried by troop units. Each time a demolition is prepared, the correct amount of dummy explosive is placed in position. When the unit's supply of dummy explosive is exhausted, no more demolitions can be prepared until additional stores are received.

When the camouflet method is used in a cratering operation, units are required to drive a hole in some suitable nearby waste ground, to fire an actual camouflet charge, and then to fill the chamber produced with an adequate amount of dummy explosive.

No demolition is considered complete unless the demolition party actually fires a primer or a small, token explosive charge as near as practicable to the site of the planned demolition.

c. Repair of Standard Bridge Equipment

After a simulated shelling or bombing of a temporary bridge, the umpire directs the actual removal of those parts of the bridge considered to have been destroyed or badly damaged. The removed parts cannot be used again during the exercise. This procedure emphasizes the need for adequate spare elements of standard bridges and of bridge materials for improvised structures. It also brings out the necessity for having adequate transportation equipment and maintenance parties, required for the repair of structures during actual operations. It is apparent that these lessons are not learned if the umpire merely rules a bridge out of action for a specified period of time.

In the case of enemy demolitions, opposing troops are in many cases presented upon arriving at a structure with a sketch depicting the existing condition of the structure. In case repair of an existing bridge is possible, passage is allowed over the original bridge once the requisite materials have been produced at the site and working parties have been there for the time calculated as necessary to effect the repairs.

10. GERMAN METHODS OF CLEARING MINEFIELDS

The following report shows the Axis methods of clearing minefields during the attack on the El Alamein front in August 1942.

a. During the Night

(1) Three or four men worked with spades, picking up mines to make one narrow gap. Immediately behind each man was a mechanized vehicle covering him with its weapons. As the digger moved a pace or two forward, the vehicle followed. No lights were visible.

(2) Transport or mechanized vehicles were driven straight at the minefields in an attempt to find at least one clear route through.

(3) It is not known whether or not this was successful, as the British abandoned the first minefield before daylight. Mines were seen to explode, however, and it is considered that several vehicles must have been destroyed.

b. Daylight

(1) Mechanized vehicles advanced about 50 yards apart on a front of about 400 yards. In front of each vehicle were men picking up mines covered by the weapons of the armor. Between the tanks, infantry advanced across the minefield in line, about 3 yards apart, with bayonets fixed. In one area, an infantry gun was seen being brought into position on the near edge of the minefield, covering the advance.

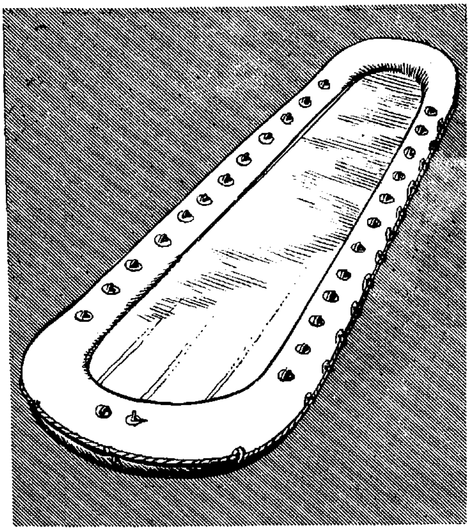
c. General

(1) Artillery fire was concentrated on the far edge of the minefield before the advance began. This fire appeared to be on areas selected for the breakthrough.

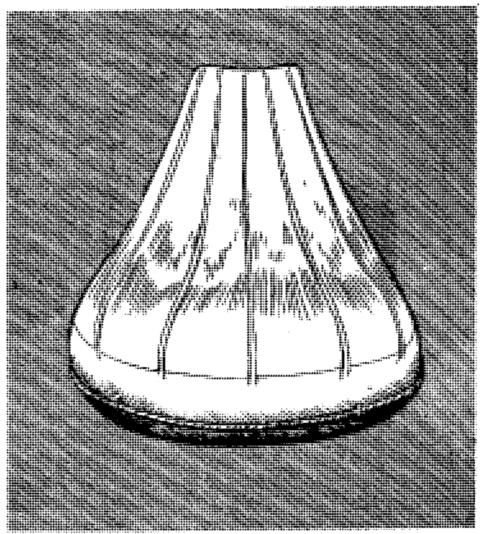
(2) No attempt was made to clear mines before the moon was up.

11. GERMAN LARGE PNEUMATIC BOAT

This German pneumatic boat is 31 1/2 feet long. It is similar to their 18-foot type, except that both ends are prow-shaped, and have a rake. The weight is approximately 800 pounds. (See accompanying sketch).



General View



View of Bottom

When deflated the boat rolls up into a cylinder 8 feet 6 inches long, and 2 feet 9 inches in diameter. The floor boards fold into a square bundle 2 1/2 by 2 by 3 1/2 feet.

The boat contained the following equipment: a number of plugs for temporary repair; 4 paddles, each 5 feet 3 inches long; two bellows-type footpumps for inflating; and wooden gratings for stiffening the floor.

The method of inflation is by using footpumps attached to the two inflation valves, one of which is located at each end of the boat. It is possible, however, to inflate the boat by using only one of the valves. The boat has eight compartments, each of which is fitted with a valve to permit passage of air from the adjacent compartment. During inflation all valves are open, but upon completion of inflation these valves are closed, thereby separating the boat into compartments. Should one compartment become damaged, the hole can be repaired, and a balanced pressure obtained by opening all valves.

As a result of trials, the boat was found to have a capacity of 26 men. Estimated capacity for men with full pack was 24.

Using 10 paddles, the boat made 2 knots in calm water, with 24 men aboard. An additional paddle was used for steering.

The boat was towed with 24 men aboard, one operating a steering paddle, at various speeds up to 9 knots. Above that speed, the boat had a pronounced tendency to buckle and was no longer safe.

Comment: The design of the boat, with tapered prow and rake, does not lend itself to the attachment of an outboard motor as easily as does the flat-bottomed 18-foot German boat. The rake undoubtedly helps in rough water.

The skids under the bottom seem to provide a definite advantage in beaching, under conditions when the boat is used either in assault crossings or landing operations. These skids are made of ordinary garden hose, seated in a rubber base so that they will fit flush against the bottom of the boat. The base and hose, after attachment to the bottom of the boat, are covered with a strip of fabric about 6 inches wide, which effectively seals the skid to the bottom of the boat.

It was not possible to determine if the material from which the boat was made was rubber or synthetic rubber. It was repaired, however, with ordinary rubber patches. There were no cementing troubles. The boat is not vulcanized.

12. ITALIAN SMALL-SCALE COUNTERATTACKS

The inferiority of the Italian to the German Army is apt to obscure certain Italian qualities which it would be unwise to ignore. Among these is the skill and promptitude of Italian small-scale counterattack from prepared positions. During the battle of Keren in Eritrea, for example, the Italians, through this tactic, succeeded more than once in dislodging the British from newly taken positions.

Since many junior Italian officers have not been sufficiently trained, these counterattacks do not always materialize. But, whenever the junior officer happens to be well trained and keen, he may prove to be a formidable opponent, and preparation to meet such action should be taken whenever fighting against the Italians.

In this type of operations, the excellent Italian 81-mm mortar (see Tactical and Technical Trends, No. 11, p. 44) plays an important role. It is significant that the 81-mm mortar allowance of the Italian infantry division in Italy has recently been increased from 24 mortars to 36, and to 45 in the latest type of motorized division. However, it remains at 18 in the North African theater.

Since July 1942, there have been three separate occasions when Italian resistance in Egypt has been an unpleasant surprise. In all of these, they were dug in and deployed in very favorable positions. At least once the 81-mm mortar was identified, and caused considerable damage.

13. INITIAL ACTION ON THE EL ALAMEIN LINE

In the initial stages of the recent British offensive in Egypt, the 51st Highland and 9th Australian Divisions were assigned the mission of pushing a salient through the minefield in the northern sector of the El Alamein line, where the terrain is absolutely flat. After a penetration had been achieved, the British X Armored Corps was to move through and fan out in rear of the Axis positions. Because of the effective fire with which the Germans and Italians covered the minefield, most of the operations had to be conducted at night, and sufficient time allowed after completion to permit the infantry a minimum of 4 hours to dig in, construct their own fortifications, and prepare to resist any Axis counterattack.

The Australian division, which was in the extreme northern position, employed two regiments forward and one in reserve. The regiment on the right flank used one battalion forward on a front of 1,000 yards. In addition to the mission of attacking frontally, this battalion also had the task of securing the northern flank of the salient opened up by both the British divisions. The left flank regiment of the Australian division used two battalions forward and one in reserve, and coordinated its advance closely with the 51st Highland Division's right flank elements, which were immediately south of them.

The Australian division, operating on a 3,000-yard front, was heavily reinforced with artillery and was reported to have used 336 guns. Thirteen of these artillery regiments (probably about 300 guns) used 25-pounder weapons. In general, the preparation by the artillery was set to begin 20 minutes before H hour, and all guns were employed in counterbattery work for 15 of the 20 minutes. It is stated that in general the British employed their artillery on counterbattery missions at a ratio of 20 to 1 (presumably this means for all divisions at the front).

The tremendous artillery barrages were apparently extremely effective, and it is reported that for 2 hours after the initial attack was launched the German artillery was practically silent, unable to answer requests from their own infantry for defensive fire. Mention is made of attacks supported by a rolling barrage which was moved forward at a rate of 100 yards every 2 1/2 to 3 minutes, but it is not apparent whether this reference is to the British operations or to the heavy Axis counterattacks.

One observer in this theater believes that the tank has definitely been beaten by the antitank gun, and consequently the use of the tank in forward positions will be primarily strategical rather than tactical. He predicates this conclusion on the fact that the German 50-mm antitank gun and the British 6-pounder (57-mm) antitank gun, as well as higher calibers, can effectively disable any tank used today. The same observer also points out that mines have assumed major proportions in any defensive system, since infantry are prevented from making direct contact with the enemy until they have cleared and crossed intensive minefields swept by the defensive fire. Apparently, the British attack did not come as a surprise to the Germans, who expected it any time after October 14. The exact sector in which the main effort was to be made, however, was definitely not known to the Axis, and the British infantry thereby gained tactical although not strategic surprise.

14. JAPANESE TACTICS AND THE EMPLOYMENT OF PARACHUTE TROOPS

The following report was obtained from observers who watched the Japanese employment and tactics of parachute troops during the occupation of Timor.

Twenty to twenty-five troop transports approached supported by bombers and fighters. The bombers flew in flights of nine in V formation.

There was no wind, and the operation took place in bright sunshine at 0830.

The objective on each occasion was a position astride our line of communication. The area chosen was comparatively flat, and covered partly with high palm trees, in places 15 to 20 feet apart, and partly with thick underbrush. There was absolutely no air opposition, and the objectives chosen were about

a mile and one-half from the nearest forward defended area, and about 5 miles from the fixed defenses.

Descents were made on 2 successive days; on each day approximately 350 parachutists were dropped, making a total of 700, which is believed to be a battalion. The jump was made from a height of 300 feet, while escorting planes bombed and machine-gunned the area. It is also reported that troops carried and fired Tommy guns during their descent.

It is estimated that each transport carried 15 to 24 parachutists, organized in groups of 6 to 8 men each.

There were apparently no containers either for arms or supplies. Men carried radio-telephone sets with batteries, and compasses were strapped to the wrist.

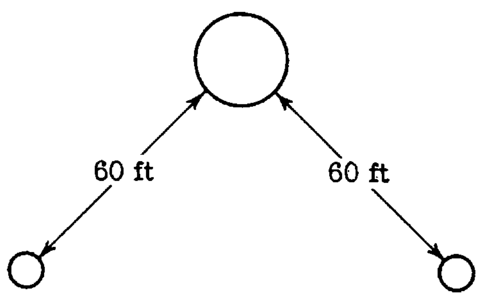
Emergency rations were carried in cellulose wrapping and consisted of rice and dried compressed fish.

Section commanders' parachutes were blue, and platoon commanders' red. Uniforms were green, buttoned to the neck, and rubber boots were worn.

15. GERMAN CONSTRUCTION AND DEVELOPMENT OF STRONGPOINT

The following steps are reported to be typical of German methods in the construction and development of a strongpoint.

<u>STEP I</u> Antitank gun position (diameter 13 ft, depth 1 1/2 ft).

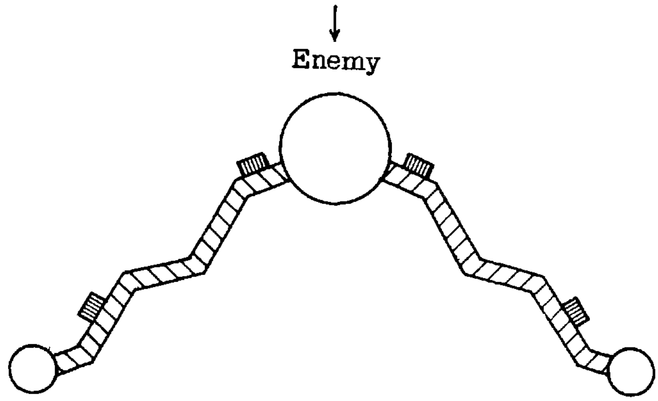


Machine-gun position (diameter 5 ft, depth 5 ft).

All three positions must be chosen so that each has an all-round field of fire.

Whenever possible, rocky ground which is likely to be exposed to heavy enemy fire must be avoided. Officers themselves should lay out the positions with the greatest care.

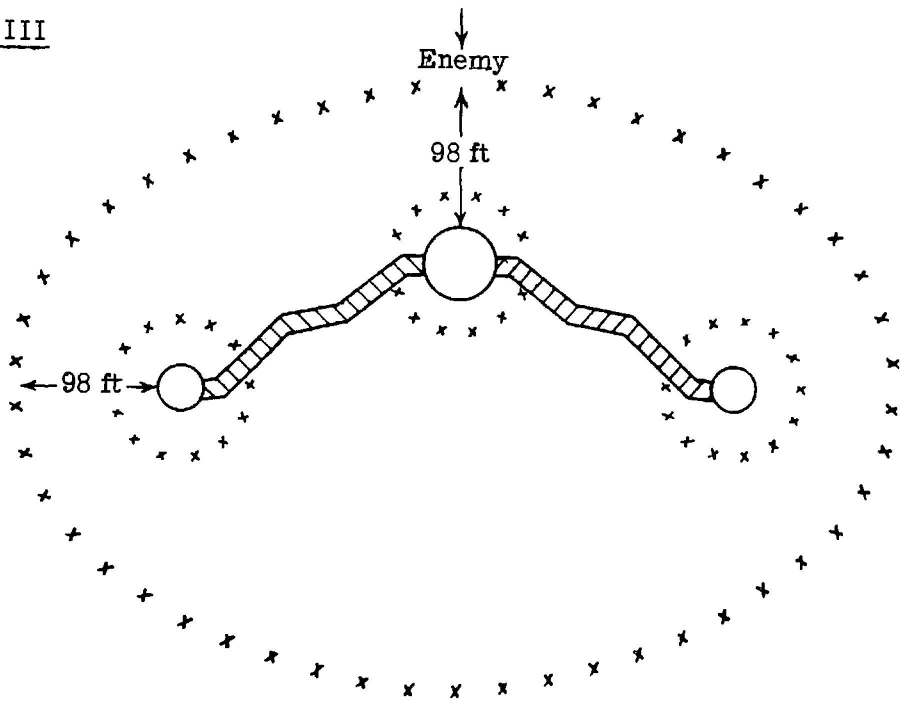
STEP II



Communication trenches, 5 feet in depth, between the three positions and dugout will be added.

Later, the trenches will be covered with boards and stones in order to make them splinter-proof and difficult to recognize from the air.

STEP III



(a) Wiring of the strong point;
(b) Laying of antitank mines in the wire;
(c) Wiring of individual positions (antitank and machine gun);
(d) Covering of communication trenches between the positions.

16. GERMAN ASSAULT DETACHMENTS

a. General

The flexibility of organization and willingness to form special groups, which is characteristic of the German army, is illustrated by the small parties known as Stosstruppen (assault detachments) formed to attack enemy positions.

This term has often been loosely used, even by the Germans themselves, to denote any assaulting troops.

A German Army High Command paper gives the following essential characteristics of an assault detachment:

(a) Specially formed for a particular object;
(b) Composed of picked men, normally volunteers;
(c) Specially equipped for its tasks;
(d) Specially trained, and, if possible, rehearsed for the operation.

It will be seen that an assault detachment is necessarily, therefore, something to be employed only in position warfare, however temporary the enemy's defensive positions may be; and that although it is principally drawn from the infantry, it will make use of other weapons besides those normal to the infantry, and will be reinforced by engineers.

The occasional nature and varying composition of assault detachments do not prevent the regular training of troops for this employment. The High Command paper referred to above observes that this method of attack was everywhere practiced during the winter 1939-1940 in view of the prospective attack on the Maginot Line and the extended field fortifications in Belgium and Holland; and that this constant practice caused attacks by assault detachments to be the one operation which the mass of the German infantry had thoroughly mastered by the spring.

b. Composition, Armament, and Equipment

Information secured during the campaign in the Western Desert last winter gives details of assault detachments which it is believed were to be used against Tobruk. From these it is possible to infer the teaching of German manuals.

The following elements are regularly included:

(1) Wire-cutting party (Hindernissprengtrupp, Sperrensprengruppe) of three or four engineers, with wire-cutters and bangalore torpedoes.

(2) Pillbox attacking party (Schartensprengtrupp, Stosstrupp, etc.) of four or eight men. This normally includes four engineers with two flame-throwers: pole and other charges may also be carried. The infantrymen are armed with hand grenades, or even with one or two light machine guns.

(3) Smoke party (Nebeltrupp) of two or three men armed with smoke candles and smoke grenades, or even with a mortar for firing smoke.

(4) Infantry support or covering party (Deckungstrupp) of varying size. It may be only 2 or 4 men with 1 or 2 light machine guns, or as many as 17 with light machine guns, heavy machine guns, 3-inch mortar, AT rifles, or even an AT gun.

There is also usually:

(5) Supply party (Nachschubtrupp) of varying size, from the infantry; often 15 men. For their function, see below. They may further be used to carry reserve ammunition.

The following can also be included:

(6) Bridging party (Bruckentrupp) of 3 or 5 men. More than one party may be taken. These may be engineers, or for simpler tasks, infantry; e.g. two parties of 4 infantrymen may carry planks and ladders for crossing an antitank ditch, and at the same time be responsible for carrying away captured materiel (Beutetrupp).

(7) Mine-searching party of 2 men with a pack radio set: this has only been found in one very elaborate detachment.

Those taking part are armed partly with rifles, partly with pistols or submachine guns. Ammunition is carried in the jacket pocket, not in pouches. All are armed with hand grenades, which may be carried in a special haversack. Spades and pickaxes are carried by some, and at least one Very pistol; panels are sometimes carried for air-ground communication. The troops wear field-service uniform with steel helmet and gasmask, and carry iron rations and canteen. The remainder of their equipment is brought up by the supply party.

An assault detachment may total anywhere from 14 to 40 men, and sometimes as many as 4 detachments may be sent out together. Detachments are organized under battalion or company arrangements, according to the size of the task. Engineers will be provided from the regimental pioneer platoon or from the divisional engineer battalion: always from the latter, when flame-throwers are used. Close-support weapons are allotted as necessary.

c. Employment

In action, the first task is a thorough reconnaissance. The assault is planned in great detail, and the assault party depends for success on coordination of the various arms supporting it. Once the attack commences, unified command is impossible. It is therefore necessary that the assault should be so organized as to run itself.

The course of a typical attack on concrete fortifications is as follows: The attack is preceded by a short artillery concentration on the objectives. Then the artillery puts down smoke, under cover of which infantry and their supporting weapons get into position at short ranges. These supporting weapons will include AT guns and possibly field guns, placed under command of the infantry; as well as heavy machine guns, mortars, and infantry guns.

When the smoke clears, all weapons open fire on the loopholes allotted to them; and under cover of this fire the infantry and engineers move to the assault.

The assault on casemates or pillboxes can be made in several ways; all depend on the principle that if you are near enough to a casemate or pillbox, you can get inside the angle of fire of its guns and be safe. Casemates however will usually be placed so that they are covered by machine-gun fire from their neighbors; and therefore they can only be attacked in this way either if supporting fire keeps the embrasures of neighboring casemates shut, or if more smoke is put down to isolate the particular fortification to be assaulted.

The actual attack on casemates may be made either with explosives or with flame-throwers.

Infantry can sometimes get close up under the embrasures and push grenades inside. Engineers, who carry more powerful charges, can blow up casemates and attack embrasures which they cannot reach by mounting charges on the ends of poles. These pole charges are a common engineer weapon. The infantry can improvise a similar charge by tying the heads of six stick grenades around a complete central grenade.

Two sizes of flame-throwers are carried by the engineers. The range of both is claimed to be about 30 yards, but may in practice be no more than 20 yards. The smaller gives a jet for 10 seconds, the larger for 25. The larger has to be hauled on a two-wheeled cart.

17. DEVICES FOR CROSSING STREAMS

The following report shows a method of crossing streams used by forces operating in India. By this method, swimmers or non-swimmers have been able to cross streams with full packs and sidearms.

The requirements are a bamboo or wooden pole 14 feet or more in length, and about 3 inches in diameter; practice if there is time; confidence and strict obedience to instructions.

The method used is to float the pole into the water at the edge of the river, and wade in keeping the pole to the front. When about chest deep, the pole is placed in a vertical position facing the direction of the current, i.e. upstream. The end of the pole is then forced down until it is between the feet; the pole is

held firmly between the feet and knees. It is easier for beginners if they hold the pole by crossing the feet over, and then between the knees. The pole is then held between the insteps.

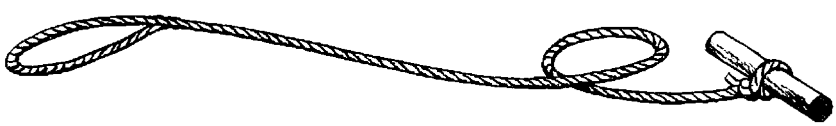
To float, the body is inclined slightly forward while the pole is held firmly between the feet and knees.

The important point is that the knees must not be bent and the pole must be firmly gripped.

It will be found that the upper end of the pole will project out of the water about 2 feet in front. Direction can be maintained by paddling with the hands. No attempt should be made, or need be made, to grasp the pole with the hands.

Provided that the butt remains between the feet, and that the knees are not allowed to bend, one is bound to remain afloat and right side up.

A toggle and loop device for river crossing is believed to have originated with the Commando troops. Each man carried a 4-foot length of rope with a loop at one end and a toggle at the other, as shown below. By linking several of these together, ropes of various lengths are made, which are very useful in overcoming obstacles, crossing streams, etc.



Toggle and Loop

18. CONSOLIDATION AFTER A COUNTERATTACK

A newly won position must be rapidly organized if it is to be held successfully. During the May-July 1942 fighting in North Africa, British troops successfully attacked a desert depression, but were then counterattacked and overrun by a superior force of German troops. The following points of interest were noted in enemy methods of consolidating the position.

Enemy salvage parties came in and began recovering vehicles and antitank guns before the evacuation of prisoners of war had been completed.

During the day the enemy used the depression very skillfully as an assembly area for tanks and antitank guns, with the tanks in hull-down positions. Tanks and guns were concentrated at any point where a threat appeared to develop or a target presented itself. The enemy appeared to operate on a shift system, fresh tanks coming up during the day to relieve those on duty.

At night the enemy had listening posts on a line marked by yellow lights showing only to the rear. The area immediately behind his outpost position was constantly covered by light mechanized patrols. Dogs are reported to have been used in conjunction with the listening posts.

A further report on the same action lays stress on the role played by tanks in enemy defensive practice. The enemy keeps groups of tanks stationed along the whole line of the position, behind the forward line. Attached to each group is a reconnaissance vehicle of the Volkswagen type (comparable to U.S. 1/4-ton), which moves about continuously and whose role is to lead the tanks against any hostile attacking party. The tanks are ready to operate at any time during the night, provided there is sufficient moonlight to give them some field of view.

19. INCREASED PROTECTION ON GERMAN TANKS

Recent Middle East reports point out that the Germans are taking considerable pains to provide additional protection for their tanks. Thus far, the measures employed for this purpose may conveniently be considered under two main headings, namely, spaced armor and improvised protection.

a. Spaced Armor

More detailed information than that previously submitted on the Mark III tank indicates the extent to which these improvements have gone. The accompanying sketches, based on actual photographs, illustrate typical arrangements of spaced armor on this tank and throw some light on these developments.

Figure 1 illustrates the general appearance of the tank when fitted with spaced-armor; figures 2 and 3 are side views of spaced-armor arrangements on the front superstructure and gun mantlet; and figure 4 is a perspective view with the spaced plate of the gun-mantlet assembly removed.

SPACED ARMOR -- GERMAN MARK III TANK

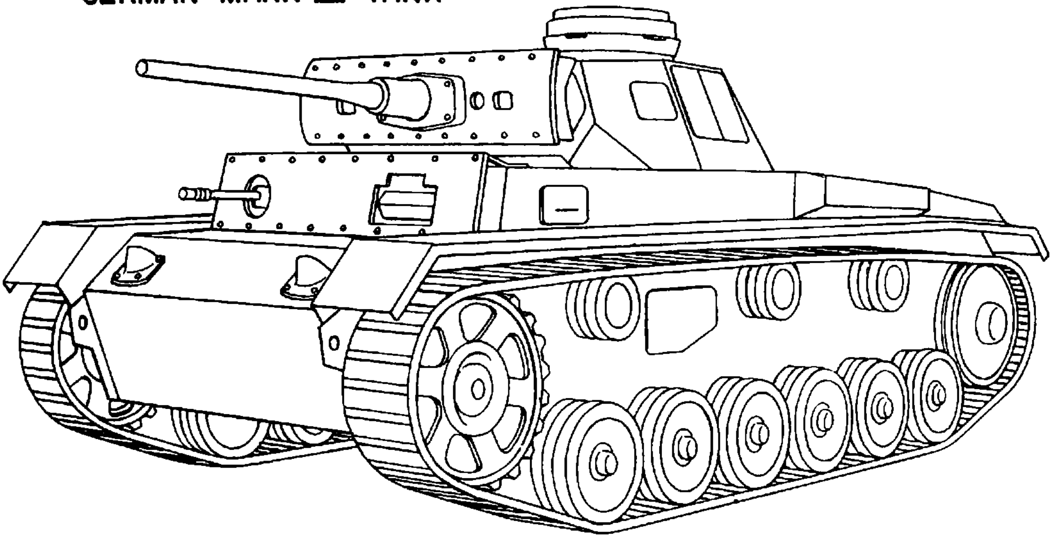


FIG. 1

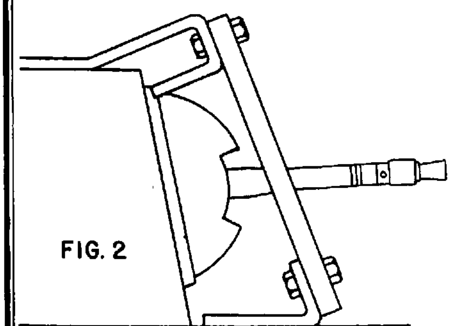


FIG. 2

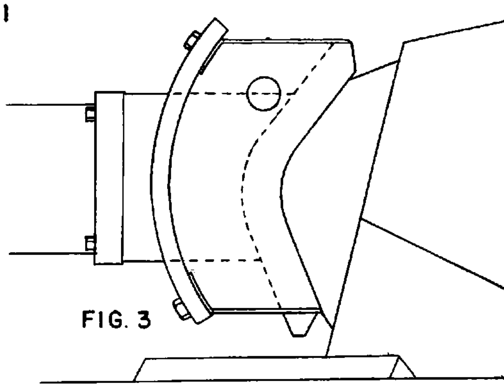


FIG. 3

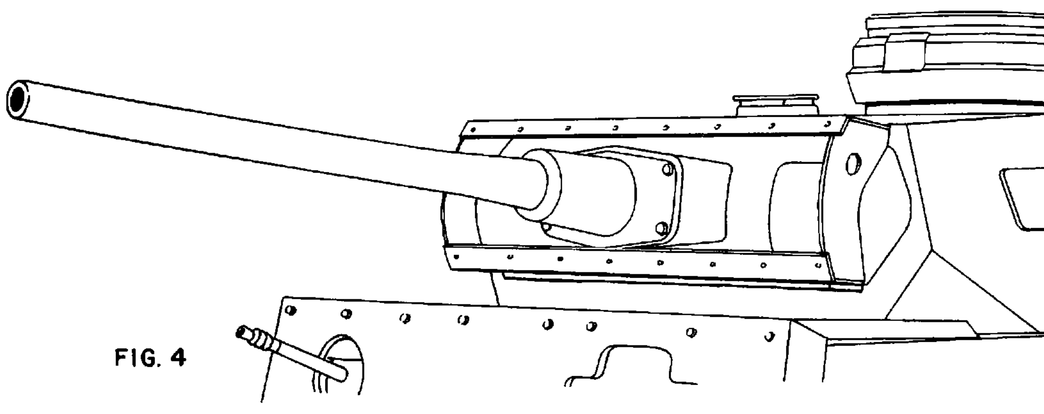


FIG. 4

The arrangement of the spaced armor on the gun mantlet appears to be more or less uniform in all the photographs so far received. In all cases the additional plate on the mantlet is curved, as shown in figure 3, and forms the front wall of a box structure, the rear wall of which is constructed of the 50-mm front shield of the gun mantlet, and the sides, top, and bottom are formed by thin sheet-metal plates arranged as shown in figure 4. In one example recently examined in the Middle East, the additional plate was 20-mm thick and was separated from the mantlet proper by an air space of approximately 120 mm (4.7 inches), the air space being somewhat larger than this at the top and somewhat smaller at the bottom.

The spaced armor on the front superstructure is arranged in at least two different ways, the sides for the air space sometimes closed, and sometimes open.

In this tank, the sides of the space between the front of the superstructure and the additional plate were closed by thin sheet metal, the only purpose of which was apparently to keep out the dust. The additional plate was fixed parallel to the 50-mm front plate of the superstructure, from which it was separated by an air space of 100 mm (3.9 inches). It was 20 mm thick and of machinable quality, Brinell hardness tests giving a figure of about 350 on both sides.

In another tank recently examined in the Middle East, the air space in the front superstructure assembly was open-sided. The space plate, which was again 20 mm thick and of machinable quality, was bolted to angle iron supports at the top and bottom; those at the top were welded to the roof of the superstructure, and those at the bottom, to the front sloping top plate of the hull. In this case the additional plate was arranged at an angle to the basic plate as shown in figure 2; the space at the top measured horizontally 108 mm (4.25 inches), and at the bottom 195 mm (7.68 inches).

In every case the additional plate on the front of the superstructure is formed with two openings, one to accommodate the driver's visor and the other for the hull machine gun. It is reported that these openings are such that the fitting of spaced armor does not seriously affect the traverse and elevation of the machine gun and does not in any way impair the driver's vision.

Although, in these two tanks, the additional plate was of machinable quality, a sample from a third tank appeared to be face-hardened, the Brinell value of its front surface being 468, against 359 on its rear surface.

So far, spaced armor has only been reported on the J series Mark III tanks with 50-mm basic frontal armor and the new long 50-mm gun. Since, however, the fitting of spaced armor is probably at present in an experimental stage, it may be found on other models of the Mark III or even on the Mark IV. If it proves a success, it will no doubt be standardized in due course.

b. Improvised Protection

Middle East also reports that German tanks are now frequently provided with improvised additional protection in the form of sand bags attached wherever possible, and lengths of track secured over vulnerable parts. (See Tactical and Technical Trends, No. 13, p. 33).

It is common for some of the sand bags to be arranged on the roof of the superstructure in front of the turret so as to shield the turret joint and the space below the bottom of the gun mantlet, and others around the front and sides of the superstructure. Precautions are taken so as not to obstruct the driver's vision or the free elevation and traverse of the ball-mounted machine gun.

Lengths of track are usually attached across the upper and lower nose-plates. They have also been found secured on the front of the superstructure between the driver's visor and the machine gun, as well as draped over the top of the turret and gun mantlet.

The length of track across the lower nose-plate is generally held in position by means of a transverse bar welded to the plate at its ends, while that on the upper nose-plate has been found attached by S hooks to the air inlet cowls of the track brake cooling system.

20. ITALIAN TANK SIGNALS

The following report gives some Italian tank signals used by Italian forces operating in the North African theater.

(a) A triangular white (wooden) signal;
Shown repeatedly, means, "Pay Attention."
Shown continuously, "Go on or Stop" according to whether the signal is made at the halt or on the move.

(b) A triangular white signal above a triangular red signal;
Shown repeatedly, "Increase distance and space between tanks."
Moved sideways intermittently, "Form line."
Moved sideways continuously, "Form wedge."

(c) A triangular red signal above a triangular white signal;
Shown repeatedly, "Reduce distances and spaces between tanks."
Moved back to front intermittently, "Form columns."
Moved back to front continuously, "Form half platoons in line abreast."

(d) A triangular red signal;

Shown continuously, "I am in trouble," "I cannot carry out my task."

All of these signals, except that last, which is made only by the tank that is in difficulty, are made by the unit commander; and individual tanks repeat the signal to show that they have been understood.

21. TANK WARFARE IN STREETS

The following comments were compiled from observations of the recent tank battles in the streets of Stalingrad.

The German commander held the mass of his tanks in the rear areas, throwing only small groups of from three to five tanks down any one street.

The accompanying infantry precedes the tanks, and only when the surrounding buildings are overcome do the tanks advance. Thus, the best defense against tanks in street warfare is to place the most experienced automatic riflemen out in front.

It is necessary to deploy tanks in the defense so that they will form a dense crossfire, enfilade, and flanking fire. This can best be obtained by controlling the street intersections. Infantry and artillery must be disposed in the intervals between, and in front of, the tanks.

It is desirable that tanks held in reserve be assembled near intersections.

Tanks should be controlled by radio. Messenger service is too slow and telephone wire is too easily broken.

The infantry commander must be located near the tank commander, and the commanders of the smaller rifle units must be with the commanders of individual tanks. The rifle commanders locate targets for the tanks, and correct and change their fire from one target to another.

22. BURNS IN THE BRITISH MIDDLE EAST FORCES

a. Causes of Burns

A report has been received which is an interesting analysis of the causes and treatment of burns in British Middle East forces. Significant is the observation that the greater number of burns are of accidental cause and could be prevented. The ratio of accidental burns to battle-casualty burns in Middle East forces is 2.3 to 1. During a period of 2 months when there was little fighting on the desert, 250 cases of burns were treated at a general hospital at Tobruk among troops of the British Eighth Army. In a series of 83 fatal cases, 15 were burned during land fighting, 15 during the bombing of ships, and 13 as a result of airplane crashes, and 40 of the fatal cases were accidentally burned - 48 percent of the total.

The cause of accidental burns is almost always ignited gasoline, and most frequently accidents occur from using the "desert stove," an improvised gasoline fire in which the fuel is mixed with sand in a can. When the fire burns low, more gasoline is poured on the stove with disastrous results. In bright sunlight it may be difficult to see whether the fire is still burning. In other cases, clothes become soaked with gasoline (it is common to use gasoline in washing clothes), a match is struck, and the clothing is ignited.

Accidental burns are often extensive and dangerous to life. A burn which is extensive, and also in parts deep, is a very serious injury and its treatment is one of the most difficult surgical problems in the Middle East.

Battle-casualty burns are a common form of battle injury. During recent fighting, burns constituted 27 percent of wounds in personnel admitted to hospitals. In tanks, the majority of such injuries are flash burns, caused by exploding ammunition. Ordinary clothing, even light khaki, gives a high degree of protection against flash burns. Study is at present being made to determine the suitability of special protective clothing for tank crews.

b. Treatment

The treatment of burns is a controversial subject, and many of the opinions expressed in this report as regards treatment will not meet with universal approval. The treatment administered depends greatly on the circumstances. Where facilities are available and time permits, "full" treatment is given: the wound is cleansed and prepared for the local application thought most suitable. This is carried out as a rule under general anaesthesia and may be preceded, accompanied, or followed by resuscitation treatment for shock. There are three main methods of local treatment: coagulation, dyes, and non-coagulation.

(1) Coagulants

The experience in the use of coagulants (tannic acid, and tannic acid--silver nitrate) in Middle East forces has not been too satisfactory because: (a) in superficial burns the surface is said to be dry and less pliable than when greasy substances are used; (b) in deep burns the coagulant remains adherent

for long periods and delays the opportunity for skin grafting; and (c) in extensive burns, sepsis is a common sequel. Also, the relationship of the absorption of tannates to toxemia and liver damage when tannic acid is used in the coagulation treatment of burns is still a disputed question.

(2) Dyes

Observations in the use of dyes (gentian violet, brillant green,and euflavine) in the local treatment of burns in Middle East forces have shown that this method of local treatment has most of the disadvantages without some of the advantages of coagulation treatment.

(3) Sulfanilamide-Vaseline Treatment

Use of a sulfanilamide-vaseline mixture in the Middle East has shown this form of local treatment to be: (a) comfortable, especially when the injured part is immobilized with a plaster-of-Paris cast, (b) in superficial burns, healing may be complete when the plaster is removed 2 weeks later, (c) in deep burns, sloughs become separated more quickly than with the coagulation treatment, and skin grafting can be done at an earlier stage. This method of local treatment is considered at present the most suitable which is available.

c. Treatment of Shock

In the treatment of the shock associated with severe or extensive burns, morphine, body warming, and transfusion of adequate amounts of plasma or serum are advocated--with the employment of rapid transfusion when the blood pressure is very low or unrecordable. If plasma is not immediately available, blood is preferable to saline or glucosesaline solution. In the treatment of the anemia which appears in the latter half of the first week and in the second and third weeks, transfusion of blood is often disappointing. The use of liver extracts and iron have been strangely neglected in the treatment of the anemia associated with burns.

d. Transportation of Burned Men

Men with extensive burns travel badly; in fact, they are more upset by travel than men with other types of wounds. Men with large septic burns are most affected, and their condition deteriorates rapidly during long journeys by road, rail, or sea. For the purpose of transport, the burned limbs are often encased in plaster-of-Paris. This practice seems to be of recent development and has been employed mainly with the sulfanilamide-vaseline form of treatment.

e. Causes of Death in Burns

In an analysis of the cause of death in 83 fatal cases of burns, shock was found to be responsible for 23 deaths, toxemia for 22, and sepsis for 38 (46 percent).

From these figures, it is seen that the most frequent single cause of death from burns in Middle East forces is bacterial infection. The organisms found are of the usual variety: staphylococci, streptococci, B. pyocyaneus, B. proteus, and coliform bacilli, etc.

Even when burns are only superficial and of moderate extent, bacterial infection occurs in many cases, especially in those burns that involve deep or extensive areas of tissue.

23. GERMAN AMBULANCE SLED

The evacuation of battlefield casualties over rough country always presents a major logistical problem. This is particularly true where evacuation must be made through deep snow; one solution to the problem of snow may be indicated in a photograph from a German newspaper showing a small snow-sled, evidently for use as an ambulance. It is equipped with three runners, one forward and two in the rear. It is powered by a small 7-cylinder radial airplane engine mounted on the back. The propeller is 2-bladed and madeof wood. The propeller guard consists of what appears to be a tubular steel frame protecting only the lower half of the propeller's arc. The sled would probably carry a driver and two patients.

24. CIVILIAN CONTROL

No campaign is fought without entailing problems concerning the adoption of measures for the control of the civilian population. A recent report from a Middle East theater, outlines some of the issues involving British procedure and policy in this regard.

a. Control of Civilians

The key question is the control of civilian movement. The policy is to prevent civilians from hindering the efficiency of troops and at the same time to upset civilian life as little as possible (at least in the countries of Allies). Provost officers must bear in mind political as well as purely military considerations in friendly countries, and should use civil police officers as much as possible.

b. Refugees

It is the duty of the staff to see that adequate arrangements are made for the control of refugees. "G" Branch (General Staff Branch--roughly equivalent to U.S. G-2 and G-3) will indicate which roads must be kept free of civilian traffic and refugees. "A" (Adjutant General's Branch--roughly comparable to U.S. G-1)* will then ascertain from which direction the flow of civilians may be expected and will then issue instructions for their diversion to roads or trails not being used for military traffic. Usually it will be quite outside the capacity of the provost company to undertake this task, and units or sub-units, each working under its own commander must be specially detailed for the purpose.

c. Inhabitants of Friendly Countries

The keynote of all dealings with an allied population is that everything should be done through the responsible civil official. In warfare of movement, control of civilians is necessary but difficult to organize in the time available. The aim is to prevent information being given to the enemy, either unwittingly or by agents. For this purpose "G" (I.) [Intelligence] will impose certain restrictions on movement and telephone communications which will have to be enforced by the Deputy Assistant Provost Marshal with the Military Police, in conjunction with the civil police of the country, if still functioning. The DAPM must therefore be well forward, and provide himself with the necessary proclamations relating to restrictions in the use of telephones and roads, to be read out and posted in towns and villages. When operations have become stabilized, the principle is to interfere as little as possible with civil organization in the rear zones. In the forward zones, military control has to be more stringent, and restrictions on the normal life of civilians have to be imposed. Control in rear zones is usually exercised by "G" (I) and Field Security Police; in the forward zones by the Deputy Assistant Provost Marshal and the Military Police. Evacuation of civilians from the forward zone would be the most satisfactory solution, but this is seldom practicable.

* See Tactical and Technical Trends, No. 11, p. 32 for reference to the British General Staff, Arms and Services.

d. Inhabitants of Hostile Countries

Evacuation from the zone of operations is the safest and most satisfactory solution, but this is difficult to arrange. "A" must make the fullest use of the existing system of civil administration supplemented by special military regulations. Provost service and Field Security Police are responsible for enforcing such regulations. Disarmament of the civil population must be carried out. (Note: Field Security Police bear a relationship to the provost service similar to that of detectives to the civil police.)

e. Cooperation Between MP and Civilian Law-Enforcement Agencies

It has been the British principle so far in Middle East theaters to persuade civil police authorities to retain and maintain control over civil populations - the Military Police confining their activities to the control of military personnel. The head of "A" Branch, accompanied by the Deputy Assistant Provost Marshal, interviews the local civil governor or Chief of Police, and having received a promise of full cooperation, ascertains the local laws. Provided the attitude of the civil population permits, particular local laws are brought to the notice of troops for observance. The central local police headquarters will generally become a "central clearing house" for complaints from both sides, and provided prompt action is taken against offenders, active cooperation will usually be secured. It will generally be necessary for a close watch to be kept by Intelligence agencies and Military Police agencies on the activities of the local police to see that they are cooperating fully; if they are not, it probably will be necessary to take over greater control, in which case it may be necessary to ask Army HQ to send additional men for police duties.

25. BRITISH SECURITY CONTROL OF PRISONERS OF WAR

Highly mobile units are faced with a special problem in handling enemy PWs. From one Middle East theater of operations, it is reported that no specific procedure seems to have been developed by the British in this particular theater, for the handling of prisoners of war by such units. The somewhat general nature of the following remarks seems to indicate that a great deal is left to improvisation in this matter.

* * *

Units capturing prisoners are responsible for delivering them to the divisional collecting center. The location of this place is fixed by the "A" Branch of the Staff [see reference in preceding article] and notified in operational orders. The provost service takes them over at the collecting center and is responsible for them until they are evacuated to the rear.

PWs are sent back in empty transport vehicles under a guard supplied from the reserve brigade or units. The strength of this guard is gauged by the physical fitness of the prisoners and the existing circumstances. One guard to every 10 PWs is considered adequate.

Anticipated fast movements of motorized troops and the conservation of striking power may preclude the detachment of sufficient guards, in which case PWs will be immobilized as far as possible, by removal of shoes, trousers, etc. A lull in the battle may then permit the detachment of troops for escort or guard duty until "B" echelon (second echelon) transport is available for movement to the rear.

26. CLEARING OBJECTS DROPPED ON ALLIED AIRDROMES

Several references have already been made in Tactical and Technical Trends to the use by the enemy of metal spikes - "crowsfeet" - dropped from the air on landing fields and motor transport roads.

In addition to dropping several hundred spikes on one of our airdromes in North Africa, according to a recent announcement antipersonnel mines, said to resemble pencils and fountain pens, were also released.

It was reported that a skirmish line of all available men provided the best method of removing spikes.and shrapnel and bomb fragments. Shells and dud bombs are flagged for subsequent removal. In the case in question, the engineering unit furnished sand bags for collecting stakes and the flags for spotting the location of duds or holes.

Following each of these attacks, it was indicated that commanding officers must prescribe that all available personnel report for duty.

27. EFFECTS OF DUST ON MOTORS

When it comes to the question of the effect of dust on motorized equipment, dust works advantageously in one respect, but in other ways has a contrary action.

Up to a point, dust has a beneficial effect on camouflaged, externally painted surfaces and serves to blend those surfaces with the color of the surrounding landscape.

On tires and rubber parts, the erosive action of sand and dust considerably shortens the effective life of such articles anywhere from 50 to 80 percent.

The most injurious action of dust is found in its adherence to oiled bearing-surfaces, such as springs and shackles, axles, bushings, etc.

To guard against this condition, constant and thorough care must be exercised, particularly on those parts which are close-fitting. Protection of precision parts, such as axle bushings and front-wheel bearings, requires close watching. Where the moving part is covered with leather or other material, easily removable for cleaning (gun axles), or entirely dust proof (traversing gears), the need for special attention is obvious. In any case, whether totally or partially protected against dust, or where there is no such insurance, it is always necessary and advisable to make regular and frequent inspections for dirt removal and fresh lubrication.

Internally, since a motor breathes air, dust is present in varying quantities depending on the equipment furnished and the precautions and care observed. The problem of letting in dustless air has been solved almost completely by the motor manufacturers, but the driver of the vehicle and the motor

mechanics of the unit must continually implement this excellent beginning. All concerned must be taught the far-reaching importance of dust wear, made dust-conscious, and thoroughly educated to properly understand the harmful effect of grit accumulations in their motors.

28. MOTOR TRANSPORT PROBLEMS IN FRENCH EQUATORIAL AFRICA

In view of the high degree of motorization in our army and the world-wide operations of our forces, the problems of motor transport movements over difficult terrain are of particular importance. A report on the difficulties encountered by the Free French in motor movements between certain points in French Equatorial Africa is therefore of interest.

The route in question is about 500 miles long. The first 300 miles are covered by a two-lane clay-surfaced road with occasional sandy stretches; little, if any, road maintenance is undertaken. Over the remaining 200 miles, the route is a desert trail, and it is over this portion that most of the transport problems are encountered.

The difficulty of the route can readily be appreciated when it is realized that a round trip normally takes a month (some vehicles have required even 6 weeks despite the fact that they had no motor trouble), and the weight of gasoline, lubricants, and water consumed per truck is 1 1/2 tons.

The major difficulties which must be overcome are heavy rains, sand, and heat; also the lack of water, refueling points, and maintenance facilities.

The rainy season lasts for about 3 months. However, it affects only the first 50 miles. After a heavy downpour, roads are usually impassable for about 2 days.

Over the last 200 miles, frequent sandstorms reduce visibility to a very few yards and make the wearing of goggles essential. Vehicles frequently bog down in the sand, and much time is thereby lost because of the difficulty of extricating them. Even if there were roads in this area, they would be covered by shifting sands in a single day; furthermore, the trail itself changes frequently because of the shifting sand. Hence, native guides must be employed to lead convoys over firm ground and at the same time maintain direction. Were the necessary navigating equipment available, it might be practical to navigate across this area as across a sea. A partial effort has been made in this direction by painting on the hoods of some vehicles a crude sundial arrangement which serves as a rough compass.

Sand fouls carburetors, gas lines, and engines, and as a result vehicles must be completely overhauled every 6,000 miles; this generally calls for new piston rings, oil and air filters, and clutch plates, and occasionally new piston-rod bearings, new differentials, and new transmissions. Experience has also

taught that an oil of exceptionally high viscosity must be used (S.A.E. 60 or 70). Furthermore, the sand makes necessary the frequent use of low gear, which means greater wear on the engine, overheating, and greater gas and oil consumption. Tires also wear more rapidly; the increased friction not only wears the tire badly, but also results in overheating which causes blowouts.

Not many precautionary measures can be taken against the sand. As far as helpful equipment is concerned, each truck should be equipped with a shovel and two metal plates, pieces of wire mesh, or similar material for use under the wheels when the truck is trapped in the sand. The French have improvised a very satisfactory system for use on trucks having 4-wheel drive on the rear axle. They use two rough-hewn poles having a diameter slightly larger than the distance between the inflated tires on the same side of the axle. By placing the poles between the tires on each side of the axle, the truck is virtually able to climb the poles to firmer ground. Treadless tires are recommended,on the theory that treads tend to cut through the hard crust of the sand, whereupon the vehicle will bog down.

Military and civilian transportation authorities in this area agree that a truck especially designed for the desert is a necessity; they claim that the Italians have such a truck operating effectively in the Libyan desert. Its general characteristics are: 8- to 10-ton maximum load, large tires (4 feet 6 inches in diameter), 4-wheel rear axle drive, super-low gear, and large horsepower. They maintain that this truck has been able to go anywhere in the desert without fear of bogging down in the sand.

The extremely hot weather causes both engine and tires to overheat. Because of the intense heat of the sun and because of the friction of the tires on the roadbed, the tires often become too hot to touch. This results in increased pressure. Unless tires are periodically deflated (dependent on the heat, but generally hourly) so as to maintain a constant pressure, there is great danger of blowouts. Tubes have been known to literally explode into as many as 16 separate pieces simply because this elementary precaution was not observed.

Because tires must be deflated periodically, each vehicle should carry a tire gauge, so that the tire pressure can be accurately checked. Obviously, at the end of a day's run tire pressures will be low and will have to be increased before the departure the next day. For this reason and also because of the high incidence rate of blowouts, one truck in five should be equipped with an air compressor which runs off the motor. In convoys, there should be a minimum of two trucks so equipped, so that in case one must drop out of the convoy for any reason whatsoever, there will always be another left. Also because of frequent blowouts, each vehicle should be equipped with two spare tires and two additional new inner tubes. Experience has demonstrated that cold patches do not hold when inner tubes become hot; evidently the rubber cement melts. Consequently, repair kits should contain materials for vulcanizing patches onto tubes. Four other precautions which are generally taken are: (a) Vehicles are not driven during the hot part of the day (1100 - 1530) except in emergency. (b) Driving is frequently done at night. (c) Whenever tires are deflated en route, they are also

doused with water. (d) During halts vehicles are always parked in the shade whenever possible.

Water is always a great problem in this region, not only because of its scarcity but also because of its impurity. One can ordinarily obtain water along the route by stopping at native villages. It is not potable, however, and can be used only for filling the radiator or cooling the tires. Drinking water is habitually carried in each vehicle; the quantity consumed during the day is replaced at the end of the day's journey. In order to do this, the water has to be treated in some manner; i.e., filtered, boiled, or treated with some chemical such as potassium permanganate.

The problem of carrying drinking water can be solved by mounting a 10-gallon barrel, with spigot or detachable plug, on the running board of each vehicle. This is the preferred position, because of the ease of getting at it. It should be detachable and should be so constructed that the inside can be cleaned periodically. This container should be covered with an inch-thick layer of absorbent material; by soaking this covering, the contents will be cooled by the subsequent evaporation of the water in the absorbent covering. In convoys this drinking water should be supplemented by water carried in several four-wheel trailers.

Fuel is a problem because of the utter absence of European settlements. As a consequence, gasoline and oil for an entire trip must be carried by each vehicle. It is never desirable to put all of the fuel for several vehicles on one truck, because if that truck breaks down, either the entire convoy must be delayed for repairs to a single truck, or part of the load of each truck must be discharged in order to take on gasoline for the remainder of the trip.

Lack of maintenance facilities is a major difficulty. It has not been possible to establish repair shops along the route; when a truck breaks down on the road, spare parts must be dispatched from the base shop and repairs then made in the field. This results in long delays for repairs which otherwise would require only a few hours.

The reporting officer makes the following recommendations:

(a) Vehicles sent to the desert should have as standard equipment: tire gauge, 2 spare tires, 2 additional new inner tubes, vulcanizing patches, 10-gallon water container covered with absorbent material, 2 or 3 quart-size oil containers, a shovel, and 2 pieces of flat metal or wire mesh 2 feet by 8 feet.

(b) One truck in five should have a mounted air compressor, run off the motor, for inflating tires. This ratio should be preserved in convoys, except that there should be a minimum of two such trucks.

(c) Trailers of 500-gallon maximum capacity should be supplied for hauling gasoline and drinking water for convoys.

(d) Standard American military and commercial trucks must be modified for use in the desert, with attention being given to: super-low speeds, two differential speeds, extra-large radiator, six- or eight-bladed fan, extra-large oil and air filters, four- or six-wheel drive, treadless tires, and tires of large diameter and great width.

(e) A truck similar to the Italian model should be especially designed for use in the desert; i.e., having as characteristics 8- to 10-ton maximum load, 4-wheel rear axle drive, super-low gears, high horsepower, tires of extra-large diameter, and with the characteristics listed in the previous paragraph.

(f) Each truck should be equipped with a small medical kit containing sodium hypochlorite or other pills for purifying water, as well as containing quinine and such emergency medicines and bandages as are normally put in such kits.

(g) Motor transport companies should be issued certain navigating equipment, and personnel should be instructed in the use of same.

29. GERMAN 120-MM MORTAR

Recent reports indicate that the German Army is preparing to adopt a 120-mm mortar either identical with or based on the Finnish 120-mm mortars made by Tampella.

This mortar is muzzle-loaded and fired by means of a trigger. Its most effective angle of fire is 45 degrees. Its range, however, is controlled more by a variation of charges, of which there are 5, than by a variation of the angle of fire.

An optical sight is used with the mortar.

Smoke bombs, which are the same weight as the high explosive, may be fired. The light bomb contains 2 3/4 pints, and the heavy, 1 gallon, of the smoke producing compound. Tested in an atmospheric temperature of minus 15 degrees Centigrade, the heavy bomb produced a smoke cloud about 40 yards in diameter.

Particulars of the Finnish 120-mm mortar, which the Germans are copying, are shown below:

Muzzle velocity	1,083 f/s
Maximum range - light	7,546 yds
Maximum range - heavy	4,921 yds
Weight of bomb - light	27.5 lbs
Weight of bomb - heavy	47.3 lbs
Total weight in action	562 lbs

Weight of barrel	187 lbs
Weight of bipod	154 lbs
Weight of base plate	220 lbs
Effective radius of burst - HE	131 ft
Practical rate of fire	6 rpm

The Finnish Army transported this weapon on a two-wheeled carriage with or without a limber, drawn by one horse. The equipment included pneumatic tires, and on the Finnish model there is no indication of a spring suspension. For use in the German Army, the suspension may have been modified to permit transport by motor vehicles in the same way as the light antitank guns. It could be very easily transported in a light truck.

Further reports indicate that the Germans intend to equip their airborne troops, including parachutists, with this mortar. As the weights of the three main parts are each not above that of a fully equipped soldier, it appears suitable for this purpose.

30. JAPANESE PARACHUTE TROOP EQUIPMENT

The information available on Japanese parachute troop equipment is somewhat sketchy as compared to the report of German equipment, analyzed in Tactical and Technical Trends, No. 13, p. 45. The following report regarding Japanese equipment gives certain details that follow substantially the same outline as in the case of the German report.

a. Personal Equipment

(1) Uniform

Information from Timor has been received indicating that uniforms worn by Japanese paratroops were green and buttoned all the way up to the neck. Rubber boots were worn. As part of their personal equipment, key sets and compasses were carried; the latter, strapped to the wrist. In the Netherlands East Indies the following uniform equipment was observed: buff-color crash helmet with ear flaps and chin strap, very light canvas webbing equipment, and water bottle.

Another report dated September 1941 indicates the following uniform equipment provided for officers, NCOs, and privates. All men wore flying jacket and trousers, and flying helmet with glasses. Officers carried an electric torch and a haversack with maps and writing utensils. NCOs and privates carried a haversack with corn, a complete change of clothing, an extra pair of boots, and one mug.

(2) Weapons

The following arms and ammunition were observed during operations in the Netherlands East Indies as part of the Japanese parachutists' personal equipment.

A pistol with 1 clip of rounds and 13 rounds loose; an unstated number of clips for rifle or light machine-gun ammunition—each clip containing 5 rounds; 5 or 6 hand grenades; and bayonet.

(3) Rations

At Timor, emergency rations were observed, carried in cellulose wrapping and consisting of rice and dry compressed fish.

In the Netherlands East Indies, parachutists were observed to be carrying glucose sweets, minor medical supplies (iodine, bandages, and so forth), cigarettes, and rum flask.

b. Unit Equipment

(1) Parachutes

Information is unavailable beyond those observations made at Timor:

section commanders' parachutes were blue, and platoon commanders' parachutes were red.

(2) Containers

The only information obtainable from the source reporting with reference to parachute containers was that at Timor it was observed that apparently no containers, either for arms or supplies, were used.

(3) Rations

Information dated September 1941 with regard to unit rations for parachute troops indicated that a 3 days' food supply for each man consisted of:

Rice	-- 2 kg - 250 grams (21 lbs 4 oz)
Fish	-- 2 tins
Meat	-- 2 tins
Tea	-- 1 oz

In view of the weight of the above-mentioned food supply, it would not seem practicable for the individual parachutist to carry this as part of his personal equipment; in other words, it would seem more probable that these rations were either dropped in containers, or provided from the air or ground by other means. The following extract from a report dated July 7, 1942, is submitted as further information pertaining to rations for Japanese parachutists.

Parachutists in Sumatra and Celebes had to carry food in large quantities, which, however, had to be as low in weight as possible. Colonel Kawashima spent 17 years in research on this problem and the following is taken from his statement:

"Iron rations for parachutists are in wafer form and consist of ground rice and wheat with a content of sesame. In addition to this, they are fed on extract of mussel-flesh, dried plums, preserved ginger, crushed bean meal and nori (a typical Japanese product used as a foodstuff for hundreds of years, made from dried seaweed and containing alkaline substances, soda, and iodine). One meal of these rations weighs 200 grams. The wafer form was chosen, as tins or boxes carried by parachutists can get damaged on landing and they constitute superfluous weight. These iron rations stand up to the climatic conditons in eastern Asia, and have been thoroughly tested by experts in Malaya, East Indies, the Philippines, China, Manchuria, and Siberia. All foreign army iron rations were tested before the selection of this type as most suited to the Japanese soldier."

31. CONSERVATION OF CLASS III SUPPLIES

It is axiomatic, yet sometimes forgotten, that tactical operations cannot be supported without the necessary supplies. In this connection close cooperation must exist between G-3s and G-4s.

It is well known that in the various Egyptian-Libyan campaigns, the availability of class III supplies has been a major factor in the success or failure of tactical operations. This fact is highlighted by Axis instructions to units in Libya on the subject of restrictions on fuel consumption.

During February 1942 the Axis ground forces (about 10 divisions) consumed 3,700 tons of fuel, a daily average of about 132 tons; between February 15th and 28th, the Afrika Korps (15th and 21st Armored Divisions, and 90th Light Division) was issued 1,038 tons of fuel, a daily average consumptiion of about 75 tons. The instructions state that these quantities were brought forward only with great effort, and that this rate of consumption could not be maintained with the available transport facilities. It was therefore directed that all movements should be considered most carefully with a view to saving fuel, and that the rate of consumption was not to exceed one-sixth of what is referred to as "normal" consumption.

The significance of the figures given above is extremely difficult to assess. First of all, it must be remembered that major operations ceased in January 1942 and were not resumed until May. Secondly, it is not clear as to whether these amounts of fuel were actually consumed or merely issued to units from supply points; however, the general sense of the statement would appear to imply actual consumption. Thirdly, it is not definite as to what weight ton is used. Finally, it is not clear whether the 1,038 tons consumed by the Afrika Korps is included in the 3,700 tons attributed to the Axis ground forces. Assuming "fuel" refers to gasoline, lubricants, and diesel oils, and that "tons" refer to metric tons (approximately 2,200 pounds), and using an average figure of seven and one-half 42-gallon barrels per short ton (2,000 pounds) of all types of fuels, it is estimated that 3,700 "tons" would constitute about 1,280,000 U.S. gallons, and 1,038 "tons" about 360,000 U.S. gallons.

As a sidelight to the above, it is of interest to note the following figures on the fuel consumption of German mechanized vehicles, based on a German manual. Light armored cars are said to average about 8 miles per gallon, medium armored cars 7 miles, and heavy armored cars 5 miles. The Mark I tank gets about 3 miles to the gallon, the Mark II about 2 miles, the Mark III and IV about 1 mile. In the case of both armored cars and tanks, the engine oil consumption is about 5 percent of the gasoline consumption.

Based on 15 gallons per vehicle, it has been estimated that it requires about 16,000 gallons of gasoline for a German infantry division, 44,000 gallons for a motorized division, and 32,000 for an armored division.

32. MOBILIZATION OF IRON STOCKS

The availability of iron stocks is essential to the conduct of total war, as witness the efforts to collect scrap in this country. That Germany is not without problems on this score is evidenced by an item in the Swiss newspaper Neue Zuricher Zeitung of July 15, 1942, according to which "the German Minister for Armaments and Munitions, Speer, decreed the institution of a very thorough campaign for the collection of scrap ferrous metal. All available iron which is not being utilized will be collected, and all sections of sizes for which there is no demand are to be returned. Completed parts for types of machinery which have now become obsolete but which remain in stock, and the machinery of laid-up installations, are to be disposed of unless it is probable that such plants are likely to start up again within a reasonable time. In general, scrap value only will be paid for this metal, with small exceptions in special cases. It appears that considerable official pressure will be put upon managers of factories to insure that they produce as much metal as possible. Russian manpower will be provided for breaking up scrap at delivery points."

GENERAL

33. FACTORS RESPONSIBLE FOR BRITISH VICTORY IN MIDDLE EAST

A U.S. observer, thoroughly acquainted with the operations in the Middle East, has concluded that the following factors were mainly responsible for the recent British victory in this theater: (a) definite superiority over enemy in fire power and personnel; (b) coordination of action by all arms; (c) determined generalship; (d) careful planning and diligent training; (e) elaborate measures to insure deception; and (f) complete enforcement of security precautions.

Most of these factors could be called the essentials of any successful offensive, but some are peculiarly related to past performances in this theater. The changes made in the British high command undoubtedly had much to do with the success of the British offensive. The primary effect of the change in leadership was a change in tactical doctrines. With regard to the measures taken to secure deception, it might be pointed out that this went far beyond the usual feint in one sector followed by the major thrust in another. The lack of natural cover on the desert battleground has caused both sides to resort to extensive use of camouflage. In this particular operation, camouflage played a very important role. British tanks were camouflaged as trucks, and complete dummy armored brigades were spotted over the desert.

Certain other factors were deemed to have been contributory to the British success, such as: heavy and effective use of artillery; concentration of armored strength; deliberate choice of limited objectives; and clearing of minefields in the rear after the initial breakthrough.

SECTION II

AMERICAN AND BRITISH TACTICS -- AS VIEWED BY THE JAPANESE

AMERICAN AND BRITISH TACTICS--AS VIEWED BY THE JAPANESE

The translation of a Japanese document (obtained from U.S. Marine Corps sources) which appears below throws considerable light on Japanese tactics. It is entitled "Land Warfare Tactics to Use against U.S. and British Forces." Apparently it was written prior to December 7, 1941, since it contains no reference to specific operations against Britain or the United States, and this omission would be unusual in a document of this nature written subsequent to that date.

Even if this document were the only available evidence on Japanese tactics, it could be readily seen that they are strong proponents of the attack. The defense plays but a relatively small part in their tactical doctrine. They apparently to do not approach the problems of a defense as we do, but think of it rather in terms of the counterattack.

Possibly the most striking features of the tactics recommended are the great emphasis placed on aggressiveness and deception, and the importance given to the envelopment as opposed to the penetration. Of interest also is the respect for the superior firepower of American and British units, which in turn leads Japanese to place great reliance on maneuver and speed of execution.

So far the Japanese have been very successful in the application of their tactical doctrines, and have accomplished much with considerable economy of force. It remains to be seen whether their offensive spirit can stand the test of attrition, and of determined opposition on terms more equal than those that have, for the most part, heretofore obtained.

The translation follows.

* * *

LAND WARFARE TACTICS TO USE AGAINST U.S. AND BRITISH FORCES

(Selections from the text compiled by the Staff of the Army in China)

PART I

U.S. ARMY METHODS AND JAPANESE COUNTERMEASURES

a. Tactics and Strategic Leadership

(1) One peculiarity of the U.S. forces is that the orders of the higher commanders are given in minute detail and leave little room for subordinates to use initiative. For this reason, if the supreme commander does not display a great deal of ability, versatile change of tactics to cope with the situation as it develops is not possible.

The training of all ranks of officers in the handling of troops, because it is based on the peacetime organization, is not of benefit. Because of this, none of these placed in command in wartime, is qualified. U.S. strategy is based on fighting a battle of fortified positions; but their rules for the conduct of battles encourage mobile warfare. In actuality, however, this is not often practiced in training and maneuvers.

Under normal conditions, the Americans display their might in carefully planned operations; but once their planned strategy is spoiled, they must get one or two high commanders to straighten things out. Hence, we must grasp every opportunity not to give them time in which to do this.

In order to capture one of their positions, they must be induced to come outside their fortifications and fight a decisive battle, or else all efforts must be made to put a hitch in their plans; and a policy of throwing them into confusion must be practiced.

Also, because U.S. tactical ideas are simple, deceptive displays of force are one of the most valuable of all anti-U.S. strategic weapons.

(2) Because the U.S. forces sometimes institute action that baffles our expectations, we must not jump at conclusions, but we must take heed of all warnings given us as a result of reconnaissance.

Again, because the character of the American is simple and lacking in tenacity, in their tactics and battle leadership they also lack tenacity; and if they meet with one setback, they have a tendency to abandon one plan for another. For this reason, we must not fail to hammer at this weakness.

The Americans are very poor in scouting, patrolling and security measures, so the effects of a sudden attack and the benefits to be gained therefrom should always be kept in mind.

b. Specific Characteristics of U.S. War Methods, and Japanese Counter-Measures

(1) The Americans make much of firepower, especially the power of artillery, and lay small stress on bayonet charges. So under the cover of night, fog, or a smoke screen, we must take advantage of the lack of flexibility of their plans, cut down the advantage they may have gained by having registered their artillery fire on us, and lead our troops into an attack which will decide victory or defeat.

(2) The decision of the U.S. forces on whether to attack or defend will depend largely on their estimates of the strength of their artillery compared to ours, so it is essential that we conceal our artillery strength and thereby cause them to underestimate it.

(3) The Americans, in forming their attack plans, regard as most important the enemy artillery dispositions. For this reason, if we utilize mobile warfare and either conceal our batteries or establish fake artillery positions, we may reap great benefit and make the Americans fail in their offensive.

(4) The U.S. forces vigorously recommend the offensive, and constantly practice it in maneuvers and training; and unless they feel a definite inferiority in manpower and more particularly in artillery, the view should be taken that they will attempt an offensive.

(5) As the rise of the U.S. forces took place during the World War, it is no wonder that they developed a definite tendency toward position warfare. Even in encounters that are not according to the "book", their leadership follows a fixed path; and they are extremely fearful of enemy counterattacks. For this reason, it is especially necessary for us to utilize constantly mobile warfare tactics.

c. Attack

(1) Attack Plans

(a) The Americans do not minutely reconnoiter the movements of the enemy, and they are particularly poor in determining the direction from which enemy attacks will come. They simply make broad plans for combatting enemy attacks against their fortified positions, but have no idea of our active defense.

We must search for ways of attack and defense against the Americans with their superior firepower; and we must avoid a stationary defense as much as possible. Even when we are, unavoidably, fully on the defensive, we must work to keep our forces mobile.

(b) In an active defense, if we base our defense on firepower in our advanced positions and do not seize every opportunity to counterattack, we will never make any gains. However, if the U.S. forces should have a marked superiority in firepower, then plan an active defense by disposing your forces so as to increase the units in the reserve. Do this by increasing the frontages assigned to front-line units. In doing this, your chances to again use reserves for flanking will be many.

(2) Leadership in an Offensive Action

(a) If the U.S. forces are in a meeting engagement or in an attack on a position (excluding heavily fortified positions), their columns will usually first diverge and then deploy; and in deciding on the plan for deployment, they consider the enemy artillery fire as a factor of first importance. These dispositions will usually be made on a much narrower front than our assembly positions are, and therefore room for their maneuvering will be lessened.

It will be beneficial to study the methods of deployment of the U.S. forces. It should be remembered that at this time communication facilities will not be complete. Also, as their leaders will not have regained control as yet, we may discover good opportunities through maneuver. For this reason, do not relax your reconnaissance of the enemy's movements.

(b) It is bad judgment to fail to use a charge to bring about a final decision. U.S. charges appear usually to be penetrations of enemy positions which have already lost all power of resistance (i.e., after fire superiority has been gained); and their training in hand-to-hand fighting is not sufficient. Because of this, it is well to consider ways of destroying them by desperate fighting within our defensive positions.

(c) We must not overlook the fact that the Americans, who believe in a principle of mutual support, are paradoxically inclined to reckless and headlong advances; and at times, they do not consider a coordinated advance, but instead rush forward alone. Consequently, when their forces are separated, crush them individually, or, by a counterattack by all your forces, endeavor to deliver a crushing blow.

(3) Meeting Engagements

(a) In meeting engagements, it is usual for them to commit their forces only when control has been regained, so take advantage of this by sending up an advance guard to hold fast, and use your main body to maneuver and strike at the enemy's flanks. Again, because the initial artillery fire of the enemy will be unorganized, bring up to the front at once a strong force of artillery to press the enemy. It is essential that the initiative be taken from him and that he not be allowed to regain it.

(b) Their advance guards have a tendency to carry out independent attacks and also often deploy the front line too broadly. By advancing a small part of our troops, we can in most cases make the enemy deploy prematurely. Also, by bringing up an advance guard, we can gather our offensive strength in one spot for a decisive attack, break through the enemy front line, and strike the main body during deployment. By training yours troops to go on to the offensive quickly, you will prevent the enemy completing their deployment.

(c) When we examine the methods of deployment of the U.S. forces, we find that there are few occasions on which unforeseen battles will result. Because this is a definite weakness of the Americans, we must train ourselves to take advantage of it.

(d) In dawn attacks, there are times when contact between opposing forces is lost. Therefore, when you fear that the Americans may launch a dawn attack at the same time that you are changing your dispositions in preparation, take advantage of the fact that while they are advancing to the line of departure, their covering fire will not yet be ready, and carry out a small attack against them. Or, depending on circumstances, if you are well acquainted with the

terrain within the enemy's lines, you may make a definite counterattack.

(e) Thus, while American attacks are not to be feared, it is most desirable that we investigate fully the ways of combatting his superior firepower. An attack or defense based on firepower will never bring good results when used against the U.S. forces.

d. Defense

(1) The American defense does not utilize the ideas incorporated in our active defense system.

(2) Defensive Dispositions

(a) In cases when there is not much time, their organization of fire is weak and there are gaps in it. The machine guns are particularly fond of displaying their independence, and coordinated fire between machine-gun units is not often seen.

(b) When there is time to spare, they display magnificent, systematic organization of fire by using many types of weapons, and aim it in front of the position; but they have no minute organization of fire (i.e., fire distribution by squads, etc.).

(3) From the preceding, it can be seen that when they are pressed for time, the American dispositions, and especially their organization of fire, are not coordinated. Therefore, we must not fail to move fast and attack quickly, giving them no time in which to prepare their positions.

However, on the whole, in deciding on a plan of attack against American positions, the possibilities of maneuver must not be overlooked. Utilize a deceptive display of strength in order to draw the enemy out of his positions. When he attacks, by using your infantry guns, keep him from breaking through. Then, practice the principle of manifesting your whole might in a counterattack.

e. Night Fighting

Insofar as night fighting is concerned, they are unlike our troops, who can attack at night and bring about decisive results, but instead, the Americans simply use the night hours to better their preparations.

For the Americans, in view of the organization of their military forces, national characteristics, and habits, it is best to make use of superior firepower and not indulge in night fighting. This is a point of which we should take advantage.

f. Pursuit and Retreat

(1) Pursuit

U.S. pursuit of the enemy starts only when the enemy has left his position and begun the retreat. In the drill regulations, it is emphasized that the whole result of battles may be decided by energetic pursuits. In actuality, because they fear enemy counterattacks and demand order in the ranks, their manner of pursuit is not vigorous. And if their pursuit is delayed by forces of the enemy, they will finally go on the defensive in order to collect their strength.

(2) Retreat

In general, their leadership in a retreat is very incapable. For this reason, once you have defeated them, great advantage may be gained by pursuing them relentlessly.

g. Duty in the Field

Duty in the field is poorly performed by the Americans, particularly their security measures and patrols that operate over short distance. Many weak points and defects are to be found here, and because of this, concealment of our movements and execution of surprise attacks is comparatively easy, especially at night. Their use of cover and concealment is poor.

h. Tanks and Automobiles

(1) Tanks

(a) Their tanks are considered able to fight independently, but coordinated action with the infantry is difficult. In consideration of this, after the tanks have smashed the enemy positions, their infantry is brought up to exploit the gains. But calm, individual soldiers, well trained in throwing explosive charges, will be able to accomplish their destruction.

(b) The movement of their tanks is extremely skillful and they are able to pass through practically any type of terrain. Consequently, we should expect attacks from U.S. tanks and be on our guard. However, their antitank measures, on the whole, are crude, and if we use our tanks well, we may crush the enemy line or break through without much difficulty.

(2) Automobiles

A great many automobiles are included in the organization of the U.S. forces, and they are thoroughly experienced in their use, planning strategic and tactical actions with them that are unthought of by us, so this is a point that demands attention. In a place where automobiles can travel, regardless of how bad the roads may be, you must consider that they will try to use them.

i. Vulnerability of the Rear

As the rear of the U.S. forces seems very vulnerable, threats and raids on their rear confuse them extremely and produce many advantageous possibilities for the conduct of operations.

PART II

ENGLISH ARMY METHODS AND OUR COUNTER-MEASURES

a. General Rules

(1) Although the English army has some mechanical mobility, in general, it does not have much maneuverability. Therefore a quick decisive battle should be sought by flanking and encirclement.

(2) Since determined action is generally better than prudence, we should avail ourselves of the enemy's hesitation in completing his preparation to gain the initiative.

(3) We must gain victory by taking the offensive and seizing the initiative, and overcoming the enemy.

(4) Since their front is generally strong and the distribution of firepower especially thorough there, we should strive to operate on their rear and take advantage of surprise. Since they are unskilled in night fighting, we should make extensive use of it.

(5) As they have great numbers of vehicles and their use of them is skillful, we must make our dispositions carefully so as to limit use of these vehicles. It is essential to be on the alert for motorized flanking and encircling movements.

(6) They definitely use gas; therefore, antigas measures are essential.

b. Attack

(1) They are generally cautious in attacking, and in planned attacks they have a tendency to use positional warfare and make exhaustive reconnaissance and preparations. We should strengthen our position more and more while they are getting ready, and at the same time, by stratagem, try to take the offensive.

(2) In attack, they endeavor to encircle or break through. However, as they are cautious when carrying out an encirclement, we should strive to utilize our maneuverability, further encircle the enemy's encircling force, and fight a

decisive action at a point where the enemy does not expect it.

Do not use a passive defense if you can help it, as it has the disadvantage of making it easy for the British to build up their strong firepower. On the defensive, choose a position where the front line will not be under the enemy's fire.

(3) Although they realize the necessity of a charge, particularly in gaining the final decision in a conflict, they do not concern themselves much about its strength, but rather strengthen their firepower and their positions. The infantry weapons for hand-to-hand fighting are few, and automatic weapons are many. The infantry just follow the curtain of fire and occupy the ground. For this reason, it is necessary to plan to split them by means of artillery and machine-gun fire and isolate the infantry. Then, by taking advantage of a good opportunity, we can counterattack. It is necessary to carry the battle out of the area selected by him so as to not come under the concentrated fire of the enemy artillery and to prevent his pouring fire on the charging infantry.

It is especially necessary, when our forces are weak, to rely on the bayonet against the enemy troops who penetrate our positions, and to be prepared to drive them back by this means in the final melee.

(4) They are also over-cautious in selecting the main objective of their attack in a meeting engagement, and ordinarily do so after the battle has begun and they have detailed reports of the enemy's dispositions and strength. For this reason, it is essential to bring about, by swift and resolute action, a decisive battle before the enemy's preparations are completed.

c. Defense

(1) Because they often utilize an active defense, it is necessary to dispose your troops carefully, and at the same time, so that they will not discover in this disposition a good opportunity, you must make them abandon their aggressive plans by fierce and resolute attacks.

(2) They generally do not give much consideration to their flanks and make their front strong; therefore, it is best that we carry out encircling movements.

(3) As they spend a great deal of time on their defensive preparations, it is essential to attack swiftly in open warfare and not give them any time to spare. Also, as they sometimes do not make a thorough disposition of troops so that they can move them to suit the situation, it is necessary to attack unexpectedly and swiftly and prevent their making suitable dispositions.

(4) Their firepower, particularly that of the artillery and machine guns, is disposed densely in front of their position, and therefore it is, of course, necessary to choose a deployment which utilizes the terrain and to move quickly. You must particularly pay heed to secrecy and the concealment of your movements and utilize darkness and smoke screens.

(5) Since they hold out large reserves, particularly mobile reserves, you must endeavor to keep your plan hidden and take advantage of surprise. Also, you must use strong striking forces and break through the enemy's lines at one stroke.

(6) When their dispositions are in great depth, to break through, you must also organize in depth and break through the position at one stroke. This is especially necessary to prevent their counterattacking with their mobile reserves and breaking up the attack. To cope with this situation, you must press home the attack with superior force and crush them. Even if there is a deep and somewhat flexible resistance in front of their main position, attack this with the necessary strength, but seek to keep your forces from getting mixed and to keep losses down.

(7) Although the artillery is under a unified command, it has various sorts of duties and is kept mobile; you can expect fire almost anywhere. For this reason, you must attack in strength and, using concentrated fire to the fullest, try to neutralize their guns.

(8) Where the position, especially a position in the rear, is established in depth, and a mobile reserve is used, particularly when a breakthrough is countered by mobile artillery, the coordination of the infantry and artillery, for the action after the penetration of the enemy's position must be very carefully planned.

(9) When they discover the attacker's penetration, they call down concentrated fire on it. Therefore, the attacker must make the penetration difficult to observe; and his artillery must take appropriate measures to neutralize this fire.

(10) They use tanks to good advantage; and measures against them are essential.

[redacted]

TACTICAL AND TECHNICAL TRENDS

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SECTION I

1. JAPANESE PILOTS

The Japanese Army and Navy have two classifications for their pilots and bombardiers, namely: "Division I" and "Division II". This classification is based on combat experience, initiative, and combat ability.

The pilots and bombardiers of Division I usually have had approximately 4 years combat experience in China. This Division totals about 1,500 pilots, including Army and Navy.

The performance of the personnel of Division II is not comparable with that of Division I, as was demonstrated during the Port Darwin bombardment of March 19 when the pilots and bombardiers of Division I, in one flight of 18 bombers, sank 11 of 17 ships on their first time over, from a height of 24,000 feet. Meanwhile, the personnel of Division II were indiscriminately bombing the airfield and hangars. Recent reports have indicated that the Japanese, in order to conserve their first-line pilot strength, are sending out their less-experienced pilots on routine missions with the leader alone coming from their first-line group.

The first-line Japanese pilot is well trained and resourceful, and handles his plane in a skillful manner; he will initiate attack, is aggressive in combat, and is a fighting airman not to be underestimated. It is also noteworthy that they will change their methods with alacrity whenever they find their aerial operations successfully countered. They are alert, and quick to take advantage of any evident weakness. A disabled plane will receive more fire than other planes in formation. Stragglers are sure to be concentrated on, and a gun not firing is a sure point of attack. Several instances have also been reported where our airmen have been machine-gunned from Japanese planes while parachuting to earth. Our airmen should delay opening the parachute when forced to leave the plane.

While there is little information available concerning the number of pilots being trained in Japan, conservative estimates placed this figure at 360 per month prior to December 7, 1941, and concluded that there were at that time approximately 9,750 trained pilots, many of whom had seen service in China. It is estimated that the Japanese have lost approximately 400 planes per month for the first 5 months of the war. Thus the rates of loss and replacement are approximately the same. The above estimated Japanese losses and production of pilots apply to a period when very little opposition was encountered by the Japanese, and it is safe to assume that when the United Nations undertake a more determined offense, the losses will be at a substantially higher rate. It is reasonable to assume that the Japanese have anticipated this and have increased the production of trained pilot personnel to meet this expected higher monthly loss. Therefore, a fair inference would be that Japan must at the present time be turning out, at the minimum, 600 to 700 new pilots per month in order to take care of losses and provide for expansion of the air forces.

In Japan it has been the tradition that Naval officers are of a higher type than officers of the Army, and it has been observed that in planes of corresponding type, the naval pilot is much harder to combat, and that apparently the

materiel, quality of personnel, and training in the Naval Service are of a higher standard than in the Japanese Army Air Forces. However, morale is undoubtedly high in both services.

2. GERMAN AIRDROMES IN WESTERN EUROPE

a. General

Since German Air Force (GAF) airdromes in the occupied countries of Western Europe have served more generally for offensive activity, they have been developed in some instances to a greater extent than those in the Fatherland. The latter are now being used principally as supply and training bases. During the past 2 years, airdromes in France and the Lowlands have undergone extensive improvements in regard to dispersal arrangements, night-landing systems, the number and length of runways, and the construction of shelters and other facilities.

Occupied France has been the theater of greatest development, with at least 500 bases now available to the GAF. Forty-seven of these are fully equipped bomber airdromes, 28 permanent fighter airdromes, and 9 bomber-reconnaissance bases. There are approximately 23 GAF airdromes and landing fields in Holland; and while Belgium has 34 German landing fields and 32 airdromes, few of these are in operational use at present. Seaplane bases are not included in these estimates.

b. Shape and Size

GAF airdromes on the Western Front are usually square in shape, and have an area of about 450 acres. Prior to 1941 few airdromes had more than one bomber runway, rarely exceeding 1,400 yards in length. Today, almost all bomber airdromes have three runways from 1,500 to 3,000 yards in length. A single instance of a bomber runway 6,000 yards long has been reported in the Morbihan area (in Brittany). The runways of bomber airdromes are flanked by specially levelled strips, probably prepared with a bituminous dressing, and providing a serviceable surface some 180 to 200 yards wide. Concrete taxi-tracks connect the runways with the dispersal areas; and there are apron assembly areas at the ends of the runways, sufficiently large for about six aircraft to assemble and take off in quick succession. Early runways on bomber airdromes were laid near and parallel to one boundary of the landing area. More recently, they were laid across the countryside, terminating at the edge of the airdrome. It is now the practice to lay additional runways across the countryside and connect them with extended dispersal areas.

Both day and night twin-engine fighters are based at airdromes similar to those used by bombers, although these airdromes are often not quite large enough, or of the proper construction, for heavily laden aircraft. The Me-110's, however, sometimes operate from airdromes which have one or two runways

from 800 to 1,100 yards long. There is a specially constructed twin-engine fighter airdrome at Denain (Northern France) that has two 1,650-yard runways.

In contrast to the square-shaped bomber airdrome, a typical single-engine fighter airdrome is long and narrow, i.e., 1,400 by 700 yards, with shelters around the perimeter and near the landing surface. It has one, or sometimes two, runways averaging 850 yards in length.

Dive-bombers operate from any of the above types of airdromes, but usually from forward landing fields that have received the minimum of preparation. The use of advanced bases enables the Germans to decrease the radius of action of the bomber, thus making it possible for a larger bomb load to be carried. These fields are about 870 to 1,100 yards square. In Holland the distinction between fighter and bomber airdromes is less apparent. Here all-purpose fields, suitable for every type of aircraft, have been developed to a high degree of efficiency.

c. Dispersal of Aircraft

The normal complement of aircraft at a bomber airdrome in the occupied countries is a Gruppe of 30 to 40 planes; however, an additional bomber reconnaissance Staffel of from 9 to 12 aircraft is sometimes found at the bomber base. An airdrome built specially for bomber reconnaissance usually accommodates one or two Staffeln, and serves equally well for a Staffel of twin-engine fighters. The take-off area of such an airdrome is likely to be small and unsuitable for aircraft carrying heavy bomb loads.

The standard of dispersal of aircraft and facilities in GAF airdromes in occupied countries is thought to be superior to that in Germany. Aircraft are dispersed according to type, bomber airdromes having large areas well removed from the field, while fighter airdromes have smaller areas near the perimeter. There is usually one such area for each Staffel of 9 to 12 planes. An airdrome at which a Gruppe is stationed will normally have three to four dispersal areas. Each dispersal area has its own aircraft shelters, repair hangar, and storehouses for bombs, fuel, and ammunition.

Dispersal of aircraft has been known to cover an area of 6 square miles, and plans are said to be under way at several airdromes to accommodate two or even three Gruppen. It is believed that as many as 2,000 fighters could be stationed in the Calais-Boulogne area, distributed among at least 50 or more airdromes, and dispersed in such a way as to be almost invulnerable to attack. The existence of stop-off and alternate escape airdromes together with operational airdromes that remain unoccupied until the day of an offensive are important factors in facilitating dispersal of air units.

Key fighter airdromes are protected by satellite or auxiliary airfields located in the same vicinity, which also function as extended dispersal areas but sometimes serve as decoys. It is believed that most of the permanent GAF fields along the French coast have satellites, over 20,000 acres of land having been

estimated as lost to cultivation because of this program. This is in marked contrast to the policy in Germany of confining shelters within small compact areas to save agricultural acreage.

d. Protection for Aircraft

The system of wide dispersal of aircraft has replaced to a certain extent the use of hangars. Hangars are now employed chiefly as repair shops, the old V-shaped and Z types, and the typical French domed structures being the most common. Medium-sized fields generally have from two to six hangars which average about 180 by 105 feet. Larger fields, like the one at Evre, in Brussels, have 40 hangars, 30 feet high in front and 15 feet high in the rear, with walls about 2 feet thick. Each is large enough to hold a bomber with three fighters under its wings, and is camouflaged as a store, cafe, etc.

Well-dispersed revetments apparently afford the most satisfactory protection for aircraft. They are of a more permanent nature than those built in 1939, which consisted of two parallel sandbag walls and were roofless. The new shelters are built beyond the periphery of the take-off runway, in woods, villages, or on farms, and are usually of U-shaped concrete construction with camouflage-net roofs into which foliage has been woven.

The concrete shelters are often built underground and have electric installations. They slope into the earth on all sides except the south, this side being left vertical since it casts no shadow. When two or more planes are stored in a shelter, they are partitioned off by blast walls erected all the way to the roof. T-shaped tunnels about 9 feet deep, into which planes are placed tail-first, are among the underground shelters, and are particularly in evidence at single-engine fighter fields. Underground and semiunderground shelters are used principally as quarters for personnel, protection for individual aircraft, and supply depots; however, entire underground airdromes are known to exist at vital points, and unconfirmed information indicates that the number of airdromes constructed in this way is rapidly increasing.

In addition to concrete shelters, there are shelters of metal construction. It has been estimated that 25 tons of iron were used in the construction of each of 35 shelters at the Vannes airdrome. There are also the "villa" type shelters with red roofs, dummy chimneys, etc., these often being grouped to give the impression of a village. Some of them, e.g., those at the Deelen airdrome in Holland, are large enough for two bomber or several fighter aircraft. Similar shelters in Belgium are made of stone blocks, with roofs of wire netting thatched with heather; one at Liege has a dummy church spire erected over it.

e. Camouflage and Deception

GAF airdromes are camouflaged by the usual methods, some of which have been already mentioned in connection with shelter and hangar construction. Simulated farms, factories, villages, etc., are common; artificial trees, shrubbery, nets to break shadows, and disruptive painting are among the usual

methods of disguise and concealment. In some cases, actual villages are taken over, their principal buildings being used for air shelters, repair shops, hangars, administrative offices,etc. The framework of these buildings is left intact, i.e., a church may serve as a hangar, or a school as barracks. Camouflage is also effected by building airdromes astride important highways, by diverting or covering streams, and by the frequent use of unmarked landing take-off zones in open country (see Tactical and Technical Trends, No. 7, p. 15).

Dummy and decoy airdromes continue to be employed extensively. A dummy airdrome, usually a replica of a real airdrome in its vicinity, is simply a fraud and is never used for landings, while a decoy airdrome, used solely for the purpose of diverting air attacks from a more important target, has been used in the past and will undoubtedly be used again. It has been reported that complete lighting systems have been set up after the pattern of installation used at a real airdrome. The use of dummy installations on active fields, or near any permanent airdrome buildings, has recently been banned since they invite fire from the enemy. Such installations, when employed, were placed one and one-half or two miles from the real airdromes.

f. Refuelling

The old "ladder" type servicing apron, which is still employed, has been the most general refuelling system until recently. Aircraft serviced by this method stood on the concrete rungs of the ladder while motor transport and bomb trolleys circulated freely on the apron on either side of the rungs. Three rungs were normally served by a fuel line, with refuelling points beside each rung. The present trend is for the aircraft to be refuelled from tanks in dispersal areas. At the Morlaix airdrome in France there is an underground concrete reservoir system for gasoline storage. The reservoirs are close to the perimeter and about 8 feet underground; they measure approximately 1,000 cubic feet and are made of concrete about 3 feet thick. They are connected to each other by central tube, and the complete system is connected to the highway by a hose. Fuel and munitions are also stored in small camouflaged trenches scattered on, or at varying distances from, the periphery.

g. Night Approach Systems

Most GAF bomber and fighter bases are now approached at night by means of the visual Lorenz blind-flying systems. Installations are still in the process of completion, and it is believed that all bases will soon be equipped with this system. Previously, a GAF bomber homing at night would locate its airdrome by means of the direction-finder station. The aircraft would then effect a landing principally by the use of non-visual procedure such as Lorenz, Z.A., etc.

Visual aids at airdromes used for night operations have been developed increasingly during the past 2 years. They include flashing and rotation light beacons, star-shell cannon, searchlights, flare-paths, and obstruction lights. The visual Lorenz is perhaps the most common of a dozen or more lighting

systems; however, a newer method about which little is known is believed to be in effect now.

A Lorenz system consists of a straight line of lights, one and one-half to three miles in length, which aligns the axis of each runway of an airdrome, and is crossed at right angles by short lines of lights 500 to 1,400 yards long. The short lines indicate the exact distance from the airdrome boundary, and the height at which the aircraft should be flying. Several systems of four to six main lines of lights usually approach the airdrome from different directions to line up each runway and to allow for variation in wind direction. Each set of lights is so arranged that it can be switched on independently of the others. Systems have now been completed to provide four to six separate cross lines instead of the two or three formerly used.

In the current visual Lorenz system there is apparently no fixed length for either the main or cross lines of lights. Both the length of the main line, and the distances of the cross lines from the airdrome boundary vary among the several sets of lights at one airdrome; thus pilots must be familiar with each set of lights employed at the airdromes which they use.

h. Protection of Airdromes

All airdromes are well protected with antiaircraft guns. The normal distribution consists of one battery of heavy guns to four or more batteries of light weapons, emplaced from one to several hundred feet from the landing ground, and a varying allotment of small-caliber machine guns, usually 20-mm and 27-mm, emplaced near the immediate approaches of the runways, or even in the midst of the installations. Antiaircraft protection is increased at the more vital bases, especially those equipped with visual Lorenz, to two heavy and eight or nine light batteries.

Heavy 88-mm guns are generally located in a four-pointed star pattern, the gun positions constituting the points, with the predictor unit in the center. Protection of guns and men often appears to be subordinated to better visibility and firing conditions. Wherever obstacles interfere with the field of fire, towers about 30 feet high and 12 feet wide are erected, on which medium and light guns are mounted. Flak towers at Diest-Schaffen in Belgium are 50 feet high, and are mounted with 40-mm guns.

The usual barbed-wire entanglements surround all airdromes; and movable objects such as metal beams are placed on the fields to prevent enemy landings. These obstructions are removed 2 hours before the arrival of friendly aircraft, and are immediately replaced after their departure. Forty cistern trucks were said to have been employed to remove these obstacles from one particular field.

i. Communications

As has been previously reported, GAF airdromes are sited near a main railroad, usually on the outskirts of villages or small towns, or about 3 miles

from cities. There is a notable increase in the number of branch lines being built, and airdromes are frequently encircled by spur tracks with underground discharging points. Motor units are employed for transporting supplies from these points, and from specially built sidings on the fields. Ju-52's continue to be used for air transport throughout the entire GAF.

j. Conclusion

From an analysis of these improvements and changes in GAF policy, we may conclude that the Germans consider the following as the chief elements of airdrome security: means of quick dispersal, adequate antiaircraft defense against low-flying attacks, effective camouflage, and (obviously) the alertness of combat crews. We have only to recall that the typical French airfield in 1940 consisted of about 250 acres and had no special runways and few other facilities, to realize the tremendous undertaking of the Germans. Their achievements represent the solution of serious drainage problems and runway construction difficulties, as well as the immediate replacement of methods, both offensive and defensive, that have proved ineffective. It is needless to say that this program has required a vast airdrome construction and maintenance crew, from one to two thousand civilian and military personnel generally being employed for one airdrome area.

ANTITANK

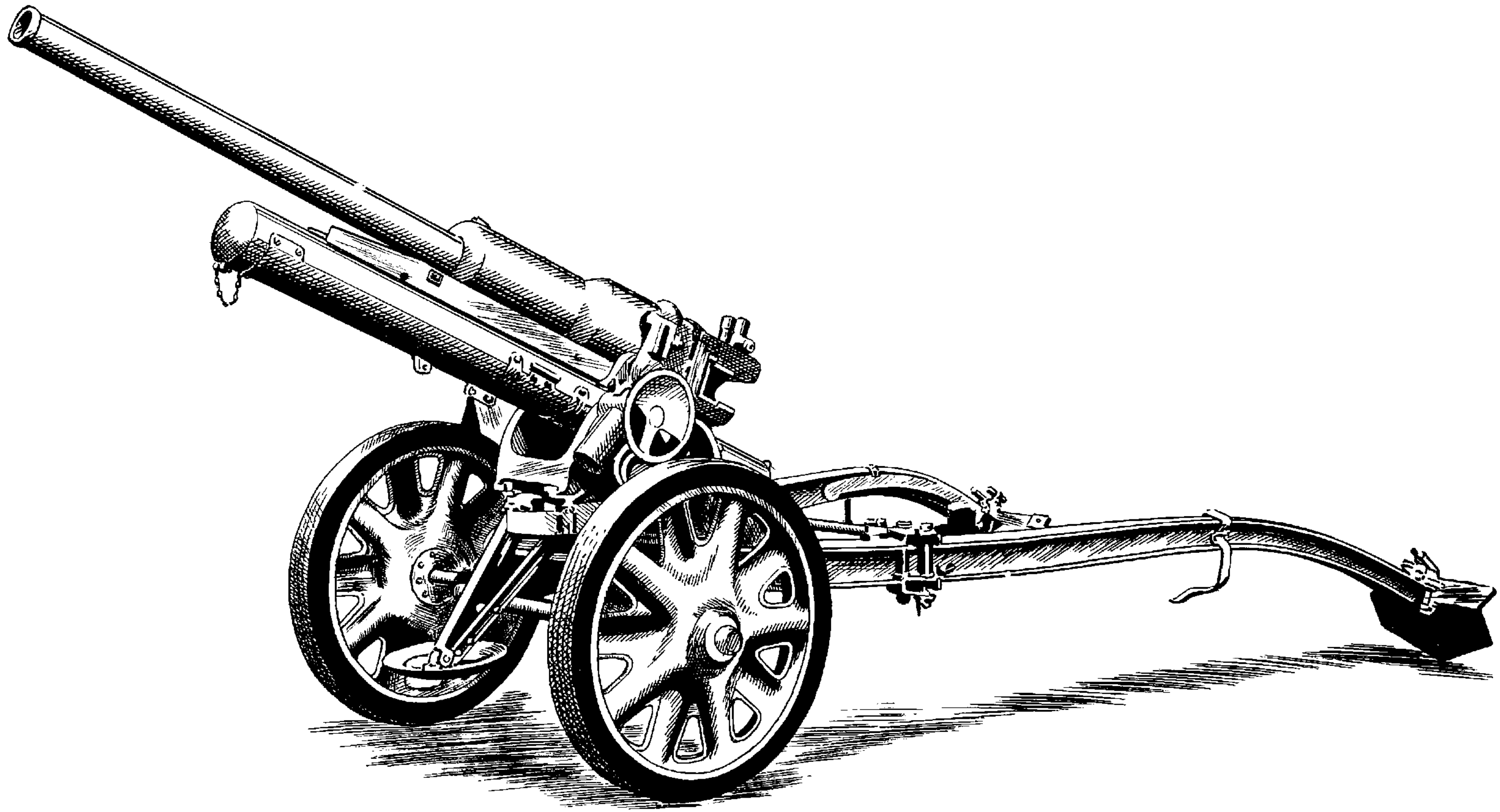
3. ITALIAN 1.85-INCH ANTITANK GUN

This weapon (see accompanying sketch) is of Boehler design, and was first introduced in 1935. It has a high rate of fire, and may be fired either on wheels or from its platform. It may be used as an infantry support gun in addition to its antitank role. This gun is a standard Italian antitank weapon.

It fires HE or AP ammunition, although the former is very erratic in performance.

The gun may be transported in any of five ways: by manpower, using special ropes; drawn by one mule; carried on a truck; drawn behind a truck; or divided into five packloads.

The disadvantages of the gun are: no protection is provided for the gun crew; the traverse is limited; and the burst is less effective than that of the British 2-pounder (40-mm).



ITALIAN 1.85-in (47-mm) ANTITANK GUN

Characteristics:

Muzzle velocity (AP).	2,067 f/s
Muzzle velocity (HE).	820 f/s
Maximum range (HE)	3,800 yds
Effective range (AP or HE)	220 - 1,100 yds
Rate of fire	
theoretical	20 rpm
practical	7 - 8 rpm
Weight of barrel	172 lbs
Weight of gun in draught.	660 lbs
Weight of gun in action.	582 lbs
Traverse on platform	70°
Traverse on wheels	40°
Maximum elevation	56°
Maximum depression	15°

At a range of 100 yards, the AP shell penetrated 55.6 mm of armor plate, while at the greater range of 1,640 yards, the shell pierced 23.9 mm of armor plate.

The minimum gun crew is three men. However, the gun is usually manned by two groups: the firing, and the ammunition.

The firing group consists of six men; gun captain, layer, gunner, loader, ammunition handler, and a supernumerary.

The ammunition group is responsible for getting ammunition to the gun position.

4. 50-KILOGRAM PHOSPHORUS INCENDIARY BOMB

Additional details have been received concerning the German 50-kg phosphorus incendiary bomb previously reported in Tactical and Technical Trends, No. 14, p. 13.

a. Description

The bomb body appears to be a one-piece steel forging and has no weld marks. The suspension eyebolt may be in the side or the nose of the bomb, as in normal 50-kg (110 lbs) HE bombs. The bomb is filled with a very thick, almost black mixture, which is so viscous that there is no sound of movement of liquid when the full bomb-case is shaken. This bomb can be distinguished from the 50-kg HE bomb by the following features:

(1) The rear of the bomb from the shoulder to the filling cap is painted red.

(2) The filling cap is also painted red, and is screwed down on a black rubber washer which is clearly visible.

(3) A sheet metal collar is welded to the case between the filling cap and the shoulder. The collar, which is painted red, is drilled and tapped to take eight screws by which the tail is attached to the bomb.

(4) On one of the bombs seen, a 1-inch red band is painted around the bomb, 1 inch behind the suspension eyebolt. The body of this bomb is painted dark gray-green.

b. Fuze

The fuze used has been the normal type. No picric pellets have been discovered in the fuze pocket, their place being taken by wooden blocks, shaped like a picric ring, and picric booster pellets.

c. Functioning

The fuze functions on impact, and the explosion resulting from the detonation of the shell casing splits the bomb-case. The subsequent operation is not known, but it is possible that the flash from the casing detonator ignites the benzene vapor and, provided sufficient oxygen is present, fires the inflammable filling. Because of the sticky consistency of the main filling, the latter does not appear to spread far from the broken pieces of the bomb. Once ignited, the main filling burns briskly, and has been known to burn for as long as 2 hours, giving off sooty black smoke.

d. Radius of Effect

Reports have been received of detonation occurring below ground level. In such cases a small, shallow crater may be formed. These craters have bee

measured, and may be up to 6 feet in diameter, and up to 18 inches in depth. Pieces of turf and earth have been found scattered up to a radius of 9 feet.

e. Dimensions

Length of bomb body	2 ft 6 in
Diameter of bomb body	8 in
Wall thickness	1/8 in (approx)
Nature of filling	Crude benzene, 86% Phosphorous, 4% Rubber (probably pure), 10%
Weight of filling	30 lbs (approx)
Total weight	90 lbs (approx)

5. GERMAN HEAVY ANTIGAS CLOTHING

A sample of German heavy-type antigas clothing has been captured and examined.

The outfit consists of three pieces: jacket with attached hood, trousers, and gloves, each article being simple in design and construction.

a. Jacket

The jacket is seamed, and cut in more or less conventional fashion with single but ample overlap on the chest. It is loose-fitting, but is provided with a substantial rubber belt at the waist, and is worn over the trousers. The hood is also of the usual design, and attached to the jacket at the neck band. It carries two side-flaps which join under the chin. These flaps, used in conjunction with the gas mask, provide an approximately vapor-tight joint. At the wrist, the sleeves are provided with fitting bands consisting of rubber-covered steel wires. These bands fit under the gauntlet of the glove to produce a vapor-tight joint.

b. Trousers

The trousers, which are the overall type, are also seamed and of normal cut. They are of ample proportions and allow bending without much movement of material. Provision is made for drawing them in at the waist. The trouser legs terminate in molded-rubber fitting bands which are of such dimensions as to suggest that they fit over a half-length rubber boot.

c. Material

The material of all the above garments (trousers, jacket, and hood) is of fabric, heavily rubberized on both sides. Their total weight is 7 3/4 pounds. One point worthy of special note is the almost complete absence of metal parts.

d. Gloves

The gloves are of thick gray, molded rubber without fabric reinforcement. They are provided with four fingers and thumb. The weight of each glove is 4.9 ounces.

e. Performance

The resistance of this suit to liquid vesicants is of a high order, being approximately 1 1/2 hours against mustard and considerably longer against lewisite. For the gloves, the figures are about 3 hours against mustard and more than 6 hours against lewisite. Tests on the seams showed that they were as resistant as the rest of the garment, which is in striking contrast to the German light antigas suit.

The aim of the designer appears to have been to obtain a high degree of protection from liquid and vapor for a reasonable length of time, and in this respect he has reportedly been very successful. The suit, however, is completely lacking in ventilation, which tends to restrict the time of wearing in hot climates to extremely short periods.

6. GERMAN GAS DEFENSE EQUIPMENT

This report on German gas defense equipment was obtained from an examination of German material captured in North Africa.

a. "Gastilt"

The German gastilt, like the gas mask, is an item of general issue. It is a rubberized sheet and is designed primarily for protection of the person in surprise attacks of liquid vesicants. Four German gastilts, complete with pouches, were found to be of the type described as "rubberized fabric," and consisted of plain rectangular sheets approximately 6 1/2 feet by 4 feet. Three were black; the fourth was khaki in color. The khaki one bore the marking "Tp," a special German marking for supplies intended for use in the tropics.

Three were contained in gray-green or gray canvas pouches; the fourth (not the one marked "Tp"), in a pouch of black American cloth-like material.

Each gastilt has two corners marked with white -- this indicates the corners which are held when the gastilt is opened for use -- which bore the following markings: "bps 1140 -- 80 op-," "evw 12342 40/X, 80 op-," "80 op 4/40/9, b f t," and "b f t, 7-41/6, 80 op (Tp)" respectively.

In every case the bottom corners were marked with a small square of green paint - presumably detector paint.

The weight of the complete outfit (i.e., a single gastilt in pouch) was about 2 pounds.

Regarding the material of which the tilts were made, it seems from the marking "80 op" and "80 op (Tp)," taken in conjunction with the appearance of an item "gasplanen, oppanol" in a captured German ledger of antigas supplies, that these specimens are made of fabric treated with oppanol, a synthetic material consisting mainly or wholly of polymerized isobutylene, which is highly resistant to both mustard gas and lewisite and is made by the I.G. Farben Industrie at Oppau - hence the name "oppanol."

b. German Light Antigas Clothing

The information at present available indicates that this outfit consists of a one-piece suit with short legs and an open back, thigh boots, gloves, and hood.

The material of the suit is described as having an external fabric layer, the inner layer consisting of hardened gelatine. Penetration of vesicants through seams and creases is immediate, but unworn portions resist mustard gas up to 3 hours.

The gloves and hood are described as being made of rubberized fabric. The seams appear to offer little or no resistance to penetration by vesicants. The legs of the boots appear to be of similar material to that of the gloves. This material resists vesicants well, but seams or creases, caused by folding, offer little resistance. The soles of the boots are of thick rubber and give long resistance to penetration by mustard gas (14 hours).

c. German Wax-Paper Gas Capes

This cape of green waxed paper measures about 70 by 46 inches and folds into about 6 by 7 1/2 inches. The paper consists of about 90 to 95 percent Swedish sulphite pulp, the balance of fibers being rag or jute waste. In its waxed state, 31 percent of the paper's total weight consists of white wax and 7 1/2 percent of a water extract which is almost certainly an alginate, and quite possibly sodium alginate. The purpose of the wax is to act as an external waterproofing agent and to counteract the brittle "feel" of the alginate. The alginate is employed as a binder instead of colophony (rosin), and as an inherent waterproofing agent to protect the paper at those points where creasing or cracking has impaired the efficiency of the wax.

The green vegetable dye of a chlorozol type does not react as a gas detector.

It is reported that when subjected to field trials, the paper cape was found to provide a high initial resistance to mustard gas, but resistance was considerably lowered by creasing.

7. BRITISH MOBILE SCISSORS-BRIDGE

Over favorable terrain, the tank is the most decisive ground weapon of modern warfare. However, it is particularly sensitive to obstacles. A relatively minor obstacle at a decisive point may so delay attacking tanks as to wholly destroy the success of the attack or result in heavy tank losses. On the other hand, one of the outstanding favorable characteristics of the tank is its battlefield mobility. In order that the tank may take full advantage of this mobility, means for the passage of obstacles which the tank cannot negotiate by itself must be made immediately available. Because of a tank unit's mobility, and the difficulty of coordination and control once the tank attack is launched, this problem of assisting tanks through obstacle areas is extremely difficult, particularly in view of the fact that the task must usually be performed in the face of hostile fire.

One possible answer to this problem has been produced by the British. They have developed and standardized a so-called scissors-bridge, for the purpose of making available to the Royal Armored Corps a tank which is capable of laying a bridge across a tank obstacle up to 30 feet in width. It has been designed so that the bridge can be laid under enemy fire with the tank completely buttoned-up, thus giving the crew a maximum of protection. The bridge has been designed to take a tracked load of 30 tons.

The scissors-bridge equipment has been standardized and adapted to two types of tanks, the Covenanter (cruiser tank Mark V) and the Valentine (infantry tank Mark III), the latter being the newer design and in greater numbers. A second type of tank bridge-layer is being developed from the Churchill (infantry tank Mark IV), which will carry a one-piece 30-foot span capable of carrying a load of about 60 tons.

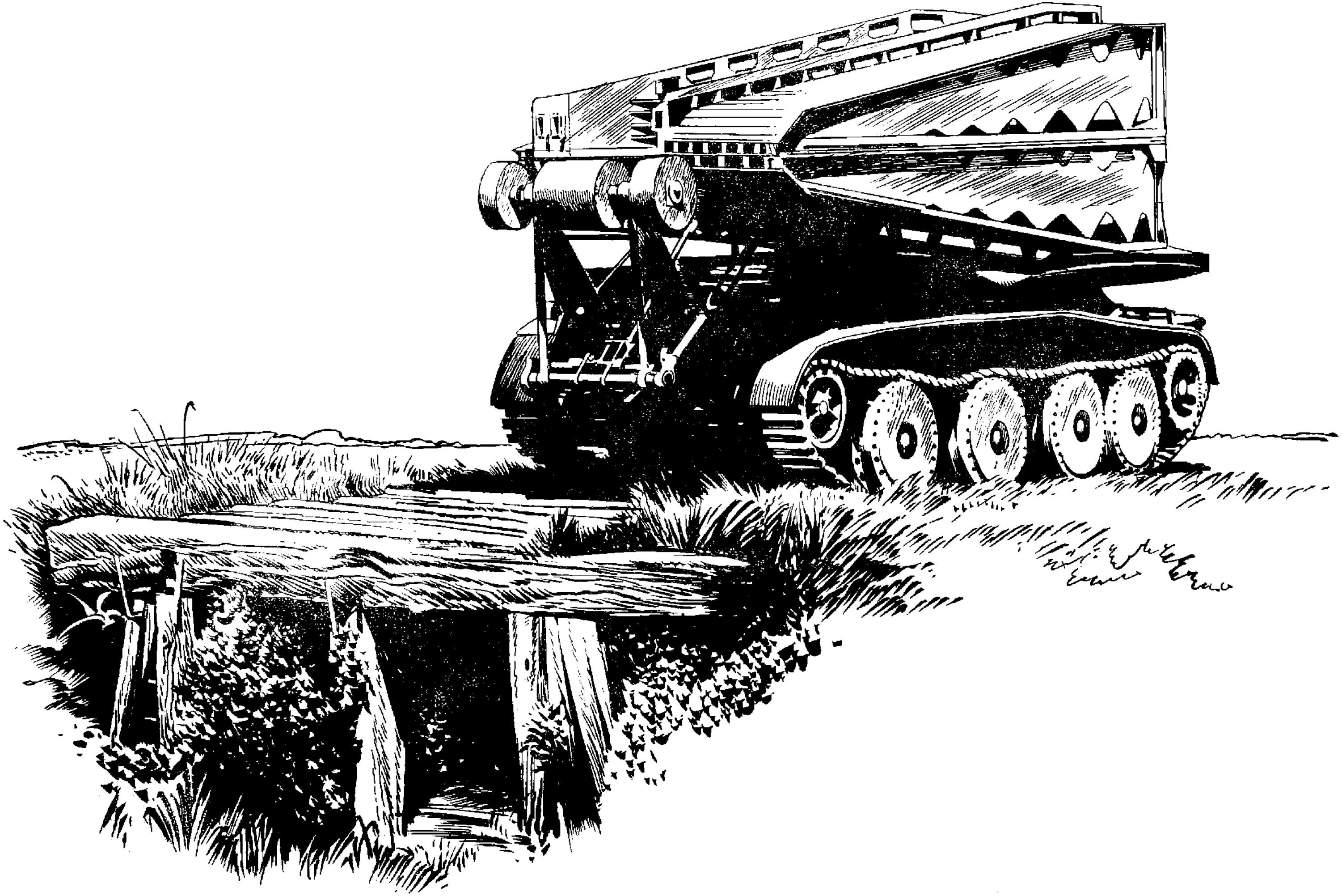
The construction of the scissors-bridge is shown in the accompanying sketches. Sketch 1 shows the bridge in traveling position; sketch 2, in a half-opened position.

General data on the scissors-bridge are as follows:

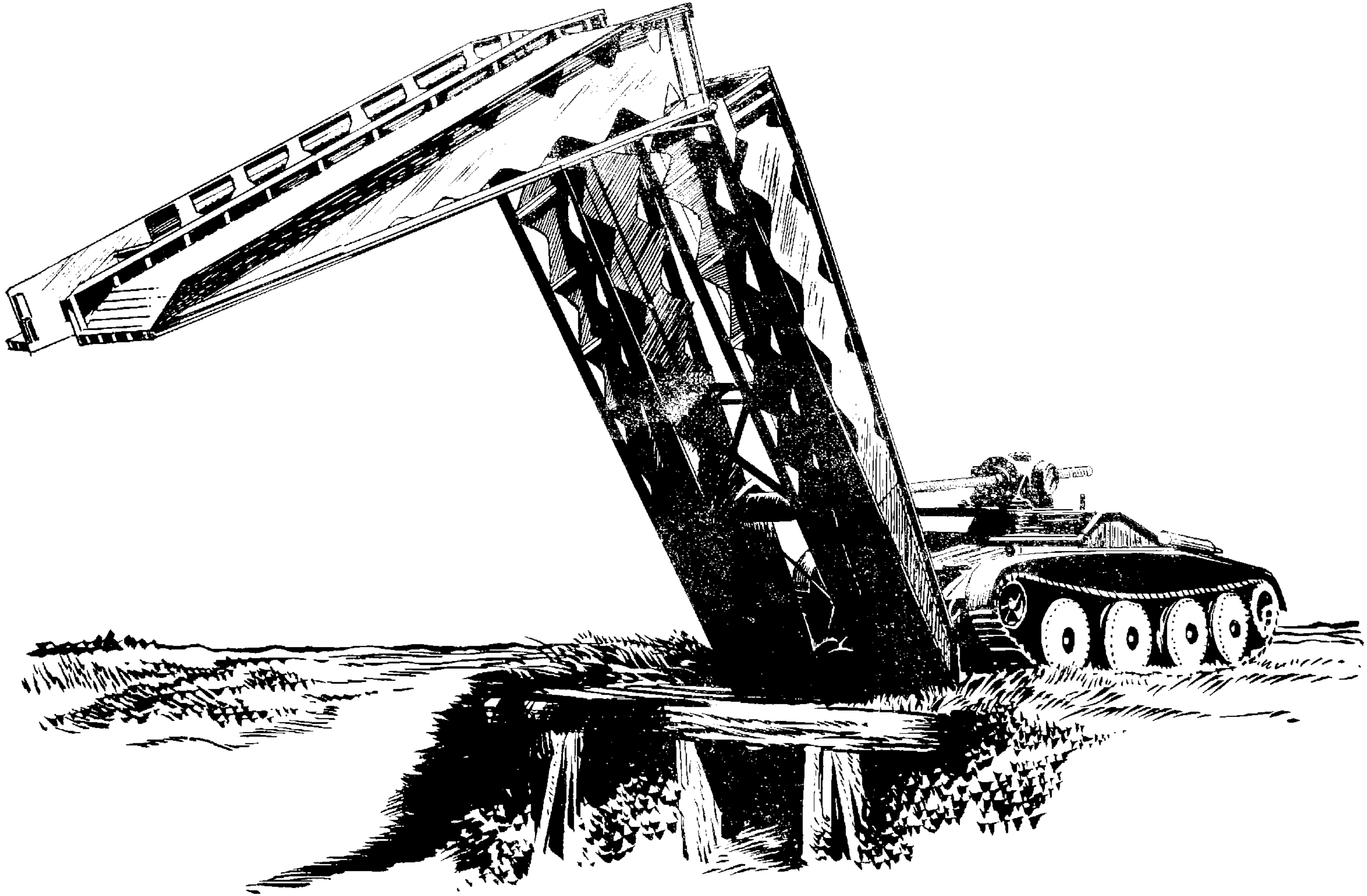
Length of bridge	34 ft
Overall width of bridge	9 ft 6 in
Maximum tracked load carried	30 tons
Power required to operate bridge	30 hp (maximum)
Time required for launching	2.5 min
Gear reduction from engine	19 to 1
Weight of launching equipment and bridge	3.5 tons
Maximum tension load on screw	30 tons
Maximum load on each cable	7 tons

The launching and recovering mechanism is operated by power taken from the fan drive of the tank engine, through a small oil-bath clutch and a 2-to-1 reduction gear, to a reversing gearbox directly beneath the screw feed gearbox.

The opening of the bridge begins after the launching mechanism has begun to pivot on the rollers of the launching frame. Since the cables are of fixed



SKETCH 1. BRITISH SCISSORS-BRIDGE--TRAVELING POSITION



SKETCH 2. BRITISH SCISSORS-BRIDGE--HALF-OPENED POSITION.

length, they act to open the bridge as it is pivoted about the rollers. Having been laid across the obstacle, the bridge is disengaged from the prime-mover. The bridge is then ready for the passage of other vehicles. To retrieve the bridge, the prime-mover crosses the bridge to the far side of the obstacle, hooks up to the bridge, pulls it back to the traveling position, and is then ready to proceed to the next obstacle. Safety devices have been installed on all the later models of this equipment, and are so arranged that the power is cut off automatically from the operating screw should the operator fail to disengage the clutch when the bridge is fully launched or recovered.

This equipment has given good service when operated by trained personnel. In one case 1,200 successful launchings and recoveries were made by one vehicle without undue maintenance.

The reporting officer submits the following conclusions:

This equipment is sturdy and compact, and apparently requires very little maintenance.

If enough of these vehicles could be supplied to armored units, they would afford a ready means of crossing tank barriers quickly with a maximum of protection for those laying the bridge.

Since the bridge is recovered after the crossing has been completed, a minimum of such bridging equipment can be carried within each division.

A decided disadvantage of equipment of this type is that it is a single-purpose vehicle, and unless a sufficient number are provided, they will not be available where and when needed.

When used as an organic vehicle of armored units, it should provide a flexibility of operations that would not be possible otherwise.

8. ENGINEER SUPPORT OF TANKS

Experience in Russia and Africa has indicated that tanks cannot operate successfully without the support of other arms. Since tanks have probably been more extensively used on the Russian front than anywhere else, of interest is the following summary of an article from the Russian newspaper Red Star of June 7, 1942, written by a Russian lieutenant, on engineer support of tank attacks on organized defenses.

During the attack, each tank should carry at least 2 engineers. The principal function of these engineers is the location and neutralization of mines. For purposes of coordination, a complete set of visual signals between the engineers (when dismounted) and the tanks must be arranged.

Comment: These engineers apparently ride outside the tank behind the turret. In this connection it should be noted that the turrets of Russian tanks are usually set well forward, thereby leaving a relatively large platform-like area between the turret and the rear of the tank. Some protection can therefore be afforded to men riding behind the turret. The Russians also use infantry mounted on tanks (Desyanti) (see Tactical and Technical Trends, No. 3, p. 44).

9. ANOTHER GERMAN BOOBY TRAP

A new version of the booby trap is reported to have been used by the Germans in Libya last spring. Trip-wires are strung to give the appearance of a minefield, and the usual gaps are left in the wire. In actual fact, the only mined areas are the gaps themselves. Care must therefore be taken before attempting to go through a gap where no traffic appears to have passed.

10. SOME BASIC GERMAN TACTICS

The following are summaries of certain phases of basic German tactics.

a. The Meeting Engagement

(1) A meeting engagement means that a commander dispenses with preliminary preparations, and deploys straight into battle. Careful coordination and a determination to succeed on the part of all concerned will compensate for the absence of preliminary preparations.

(2) A commander will not commit himself to a meeting engagement unless either:

(a) he feels that his troops and leadership are superior to that of the enemy (this does not necessarily mean a numerical superiority) or;

(b) he would, by waiting to launch a deliberate attack, sacrifice ground which he cannot afford to lose.

(3) Sound tactical decisions in the initial stages are essential. Mistakes cannot afterwards be rectified. The worst mistake of all is hesitation.

(4) The advance guard will delay the enemy and seize important positions, e.g., for artillery OPs. It may therefore:

(a) attack with a limited objective;

(b) defend its existing positions;

(c) withdraw to more favorable positions. (Withdrawal is likely to hinder the deployment of the main body.)

(5) The main body will deploy immediately. To wait for further information in the hope of clarifying the situation is wrong. Time will be lost and lost time can never be regained. The time available determines whether the commander should concentrate his troops before launching them to the attack, or launch them on their tasks as they become available.

(6) The meeting engagement will normally take the form of a frontal attack by the advance guard, combined with one or more enveloping attacks by the main body.

b. The Deliberate Attack

(1) The object of the attack is to surround and destroy the enemy.

(2) A strong, rapid, enveloping attack can be decisive, provided that it really gets to grips with the enemy, and that the enemy is pinned down by frontal pressure which will be exercised mainly by fire.

(3) Enveloping forces must move in depth if they are not to be themselves outflanked. All enveloping attacks ultimately become frontal.

(4) In all attacks, the commander will select a "Schwerpunkt" or point of main effort, where the bulk of his forces will be employed. ("A commander without a Schwerpunkt is like a man without character.") The considerations when choosing this point are:

(a) Weaknesses in the enemy defense;

(b) Suitability of the ground for cooperation of all arms, but especially for tanks;

(c) Avenues of approach;

(d) Possibilities of supporting fire, especially by artillery.

(5) Boundaries and objectives are allotted to attacking units. This does not mean, however, that a unit must cover the whole ground within its boundaries with troops. It will choose within its boundaries the best line, or lines of advance, and dispose its troops accordingly. A Schwerpunkt battalion can be allotted about 450 yards of front, while a battalion which is attacking in the non-Schwerpunkt area may be given 1,000 yards or more.

(6) An attack on a narrow front must have sufficient forces at its disposal to widen the breach, maintain its impetus, and protect the flanks of the penetration. Once an attack has been launched, it must drive straight on, regardless of opposition, to its objective. It is wrong for the leading attacking troops to turn aside to deal with threats to their flanks. This is the task of the troops which are following them.

(7) A breakthrough must be in sufficient depth to prevent the enemy from establishing new positions in rear. The breakthrough cannot be successful until the enemy artillery positions are captured. This is the special task of the tanks.

(8) As soon as enemy resistance weakens at any point, all available fire and forces must be concentrated to insure the success of the breakthrough.

(9) Continuous artillery support is essential. Therefore artillery must be kept well forward.

c. The Pursuit

(1) If the enemy is able to withdraw under cover of a rearguard, the attack has failed. He must then be pursued.

(2) The object of the pursuing forces will be to encircle and destroy the enemy. Infantry and artillery alone are not sufficient for this.

(3) Aircraft will attack defiles on his line of retreat, and motorized elements will endeavor to pierce his front and envelop his flanks. A Schwerpunkt and clear orders are just as necessary in this operation as in any other.

(4) The task of the pursuing forces is to interfere with, and if possible stop, the enemy's withdrawal, so that he can be dealt with by the slower-moving infantry and artillery which will be following up.

(5) Troops pursuing the enemy may find themselves in great difficulties owing to the speed with which they move and the exposed positions in which they may find themselves. They must be prepared for this, and must rely on aircraft and the slower-moving infantry and artillery to get them out of their difficulties in due course.

d. Defense

(1) A Schwerpunkt is as necessary in the defense as it is in the attack.

(2) A defensive position is only of value if the enemy must attack, or if it is so strong that the enemy is afraid to attack it. If the enemy can avoid a defensive position by passing round its flanks, it has no value.

(3) Defensive positions will be held to the last man.

(4) Essentials of a defensive position are:

(a) A good field of fire for all arms, but especially the artillery;

(b) Good observation;

(c) Concealment;

(d) Natural protection against tanks;

(e) The ability to concentrate the fire of all weapons in front of the main line of resistance.

(5) The defensive position is divided into covering force, outposts, and a main position. The forward edge of the latter is known as the main line of resistance.

(6) The task of the covering force is to deny good observation points to the enemy and to hinder his advance. They will be approximately 6,000 to 8,000 yards in front of the main position. Mines and obstacles will be used to strengthen the position of the covering force. The covering force must not expose themselves to the danger of being overwhelmed. They will be withdrawn at a definite time. They will normally consist of small mobile forces. Their principal task is to force the enemy to deploy.

(7) The outposts are responsible for the immediate protection of the main position. Their tasks are:

(a) To prevent the enemy from surprising the forces holding the main position;

(b) To mislead the enemy as long as possible as to the dispositions and situation of the main position;

(c) To protect advanced OP's.

They will be withdrawn when the situation makes it necessary. They are normally 2,000 to 3,000 yards in front of the main position.

(8) The main position must be defended in depth. This consideration is paramount. Areas and not lines will be defended. If the enemy should succeed in penetrating a position, he must be faced by a series of defended areas, mutually supporting one another by fire, so that in the end he collapses under the concentrated fire directed at him. A battalion will defend from 800 to 2,000 yards.

(9) The withdrawal of both covering forces and outposts must be carefully planned, to avoid masking the fire of the main position.

(10) Penetration must be met by immediate local counterattacks with limited objectives, carried out by small parties of infantry, and if possible against the enemy's flanks. Unless tanks are available, a deliberate counterattack will succeed only if carried out by superior forces and as a surprise against one or both flanks of the enemy penetration. Like any other deliberate attack, it requires preparation.

e. Village Fighting

Troops are too easily attracted to villages. These give some cover from fire, but also draw it, and may become traps.

(1) Attack

(a) In attack, villages should be bypassed if possible. The enemy in the village must, however, be pinned down, chiefly by artillery fire, when this is happening.

(b) If they must be attacked, heavy supporting fire is needed on the nearer edge, especially on isolated buildings and small groups of houses.

(c) Leading troops will avoid the streets, and fight through backyards and gardens to the far end of the village. These troops are difficult to control and support, and must therefore operate in small independent groups. Their tasks must be accurately laid down, and each group must have its own supporting weapons.

(d) Reserves must move close behind these leading groups, as they may easily get into difficulties.

(2) Defense

(a) Well-built villages make good strongpoints.

(b) Their edges are shell traps. The main defended line should therefore be either inside or outside, not on the edges.

(c) If a village is favorably situated, it should be turned into a strongpoint organized in depth. The irregular shape of its approaches should provide ample opportunities for flanking fire.

(d) Villages are especially useful as antitank positions.

(e) Reserves must be held in readiness outside the village to deal with the enemy's probable attempts to bypass it.

11. TRAINING OF RUSSIAN AUTOMATIC RIFLEMEN

The following report, a translation of an article by a Colonel in the Russian Army, is believed to give the latest Russian thought on the training of the automatic rifleman. The Russian automatic rifleman here referred to is equipped with a weapon comparable to the Thompson submachine-gun. According to a Russian instructional poster, best results are obtained with this weapon as follows: single shot, up to about 300 yards; short bursts, about 200 yards; long bursts, about 100 yards.

The fundamental assignments of the automatic riflemen are:

(a) To break up, or throw into confusion, enemy battle formations by sudden assault fire, creating the semblance of encirclement where possible;

(b) To filter through the gaps between the enemy units, and cause heavy losses by striking at his flanks and rear;

(c) To disorganize enemy control by sudden assaults on his staffs and command posts;

(d) To capture and hold important strategic points (crossroads, railheads, bridges, etc.).

It may readily be seen that men required for such tasks must be trained primarily as attackers. They must be excellent athletes and bold fighters. Furthermore, they must be capable of self-sacrifice, and have the ability to operate under any weather conditions, in the daytime or at night. It is of prime

importance that they remain cool under any battle conditions. Surprise is always the basis of their action. In many cases it is necessary to creep up to within 150 to 250 yards of the enemy without being detected, and open fire so as to throw the enemy ranks into confusion if not to wipe them out.

It is necessary to select candidates carefully for this specialty in the Red Army. The men must be physically well developed, as well as in perfect health, particularly as regards eyesight and hearing. Their will-power and determination must be of the highest caliber.

The program of training for automatic riflemen is drawn up with special consideration as to their battle functions. The individual training of the automatic riflemen approximates that of the infantry riflemen in the elementary stages. Emphasis is placed on the following:

(a) Thorough familiarity with the automatic rifle, to include reduction of stoppages and care in the field;

(b) Marksmanship, to include firing from all positions at stationary, moving, and surprise targets;

(c) Throwing of grenades and gasoline bottles, especially against tanks, embrasures, and trenches;

(d) Ability to ski;

(e) Self-orientation by azimuth, compass, or map at any time.

In the individual tactical training of automatic riflemen, 8 to 10 hours are devoted to courses in: "The Automatic Rifleman in Offense," "Actions of Automatic Riflemen in Attack and inside the Enemy Defenses" and "The Automatic Rifleman in Defense." Stress is laid upon movement by rushes and crawling noiseless approach to enemy positions, use of camouflage, and utilization of cover. Each trainee must learn the various means of preparing satisfactory fire positions for prone, kneeling, sitting, and standing fox holes. He must also know how to fire from skis and tanks.

The unit tactical training includes courses in: "Action of Automatic Rifle Units in Attack and inside the Enemy Defenses," "Action of Automatic Riflemen Accompanied by Tank Destroyers in Offense," "Night Attacks by Automatic Rifle Units," "Automatic Rifle Units in Defense," "Automatic Rifle Units in Encircling Movements" and "Action of Automatic Rifle Units in Rear of the Enemy."

All studies should be conducted under practical conditions which approximate battle conditions as closely as possible, i.e., in snowfall, fog, poor visibility, etc. These studies should be filled with adverse situations to complicate operations, such as sudden assault from ambush, outflanking, appearance of enemy on the flanks or in rear, and encirclement.

Such practice develops initiative, cunning, "fight," and ability to think calmly under battle conditions. An automatic rifleman must never be allowed to forget that he may have to fight as an individual, separated from his unit, at any time and under any conditions. On the way to and from exercises, such factors as defense against aircraft, antitank defense, defense against motorized units, etc., are introduced and absorbed. Ability to dig in quickly, to pass through barbed-wire entanglements and other obstructions, and to work while wearing the gas mask,is emphasized.

In order to relieve monotony and to keep interest of the trainees alive, it is suggested that the different subjects be taught in varied, short lessons to achieve desired standards. A model daily lesson outlined early in the course consists of: complete assembly and disassembly of the automatic rifle; fire from cover; observation on the battlefield; discovery and choice of targets; study of grenades; and use of hand grenades.

Comment: Although the actual number of automatic rifles in Red Army infantry units is not known, it is believed to be comparatively high. Before the war with Germany, there were at least two per rifle squad, and it is believed the number per large infantry unit has been increased.

The Soviet press has repeatedly emphasized the importantce of automatic rifles. Many photographs taken at the front show whole units of automatic riflemen.. The Red Army "desyanti" troops who ride the tanks are always pictured armed with this weapon. Pictures of junior officers with this weapon have been noted.

As the Red Army teaches "close-in" fighting, using short ranges, it is readily understandable why so much emphasis is placed on this weapon and on the training of men to use it in the proper manner. The above article deals with the ideal training which is striven for but not believed to be achieved. The average automatic rifleman is, of course, more highly trained than an infantry rifleman.

12. NOTES ON OPERATIONS IN MALAYA

"One of the reasons for our failure in the Malayan Campaign was that we were mentally and physically surprised by actual conditions of jungle fighting." After arriving at this conclusion, British General Headquarters in India issued a long report containing an analysis of the difficulties faced by the British troops in Malaya, suggestions for overcoming them in future campaigns, and, finally, suggestions for specialized training of troops to fight in the jungle.

In this campaign, as in others, bombs and machine-gun fire from enemy aircraft had an unduly detrimental effect on the morale of the troops unless they were allowed to engage them with small-arms fire. The material effect of such firing is relatively unimportant compared with the morale effect, which is enormous.

The jungle growth in Malaya falls into two categories: primary jungle, which is natural vegetation that has not been touched; and secondary jungle, which consists of terrain cleared of primary jungle but subsequently overgrown by very dense underbrush. In the first type, visibility is usually from 20 to 30 yards, and on the tops of hills the foliage is quite thin. Travel through this type of vegetation is not too difficult and requires only a small amount of cutting. Secondary jungle, on the other hand, requires heavy labor to cut through the ferns and brambles; it is found on the sides of roads and the banks of rivers, often giving the impression that the primary jungle beyond it is also impassable.

In Malaya, as in nearly all jungle country, there are a small number of open areas, in this case, the tin mines. However, little use could be made of the effective fields of fire, since these areas were nearly always outflanked.

The British comments emphasize a striking similarity between jungle warfare and night operations, in that both favor the offensive. The extremely limited visibility, the small fields of fire, and the impossibility of securing effective artillery support all hinder the defenders and favor the attackers.

a. Difficulties of Jungle Warfare

One of the most significant features of jungle fighting was found to be the unusual amount of fatigue which troops felt in this type of warfare. Called upon to march long distances without the aid of their motor transport, often isolated from supplies and support, and subjected to the enervating climate and difficult terrain of the jungle, soldiers were much more susceptible to fatigue than usual.

Morale, too, was affected by conditions not encountered in normal types of warfare. Tactical situations often appeared much worse than they were, since control of subordinate units was frequently lost in the dense jungle where communications presented unusual difficulties. It was found that rumors were even more prevalent than usual among groups of soldiers, and this, also, was at least partially due to difficulties with communications. The British believe that greater efforts must be made to maintain communications, not only for command purposes but also to support morale, by keeping all the small groups informed of the local, and so far as possible, the general situation.

b. Japanese Offensive Tactics

The Japanese invariably advanced on as broad a front as possible, making use of all available communications (roads, railways, rivers, and the sea) as well as sending their infantry through the jungle. In attacking, they would nearly always undertake to contain the forward defenses and then make an envelopment. The British stated that nearly every time that light holding attacks were made against their forward positions, they could be sure of an impending encirclement. It was also noted, however, that when the British flanks were effectively secured, the Japanese did not hesitate to make a frontal attack aimed at infiltration and penetration. Such tactics obviously emphasize the necessity for allotting the minimum number of troops to the strategic defense of vital areas

and retaining the maximum number for counterattack. They also emphasize the vital necessity of maintaining control of these reserves through proper communications.

It is interesting to note that the Japanese ordinarily launch two encircling attacks in depth, the first to a depth of 1,000 yards, and the second to a depth of about 5 miles. These figures apply to a Japanese regiment. Ordinarily, when contact was made at about 0800, the first encircling attack came almost immediately and the second sometime in the early afternoon. The first, shallow attack was not considered dangerous by the British and in some actions the Japanese omitted this preliminary and concentrated on the larger encirclement. During these attacks, the Japanese employed a holding detachment against the British front lines.

c. Artillery

The jungle did much to limit the effectiveness of artillery, but where it could be employed it caused the Japanese a great deal of trouble. Captured reports nearly always referred to British artillery in terms of the greatest respect. The best type of artillery fire was found to be a rolling barrage laid astride a road on a front of 300 to 400 yards.

d. Tanks

Since the few tanks that were used were confined to the roads, the problems of antitank units were greatly reduced. Often as many as 30 to 50 tanks participated in one attack, but they were usually easily ambushed. Although the fronts were not vulnerable to the 2-pounder, they could nearly always be knocked out by a hit on the side or the rear.

e. Communications

Individual runners were the most satisfactory. Visual signal devices were practically useless, and there was seldom time or material to lay wire. Some use was made, however, of civilian communication facilities. When this was done, the exchanges had to be carefully guarded and supervised by military personnel, since the local operators could not be depended upon. In the few cases where wire was laid, it functioned satisfactorily, and was not so vulnerable to enemy bombing and artillery fire as it would have been in more open terrain. The range of radio was greatly reduced by the jungle, and it seldom worked at night. Small "walkie-talkies" were the most valuable form of radio and lent themselves particularly well to the operations of small groups. Code was almost never used below division headquarters, for runners took less time than coding and decoding.

f. Personnel Vehicles

Tracked carriers and armored cars were effectively used where the road net was satisfactory. The carriers, however, in addition to being vulnerable

to armor-piercing ammunition, were also inviting targets for grenades dropped from trees, a favorite Japanese trick. Wire netting over the tops of carriers would have been an effective method of neutralizing this danger. The light machine gun on the carriers had the advantage of height and was almost never removed and used on the ground. The armored car, although even more road-bound than the tracked carrier, had the advantage of operating silently and could, therefore, be used in mobile surprise attacks. It also had heavier and better armor, making it less vulnerable than the carrier. In the withdrawal these armored cars were usually the last to go, for they were particularly suited for ambushing the enemy.

g. British Suggestions for Offensive Tactics

In jungle warfare the advantages accruing to the attackers are so great that the British believe the careful working out of a tactical plan should be subordinated to seizing and maintaining the initiative. This does not mean that thorough grounding in tactics and techniques of small groups, and of the individual soldier should be minimized, but rather that "the essence of the encounter battle (meeting engagement) is that it must be fought automatically by all officers and men according to a battle procedure...constantly practiced and applied to all types of ground."

As a result of these observations this report suggested the following tactics to British troops:

The success of the encircling attack lies in its speed. To attempt this, highly trained jungle troops, capable of quick cross-country movement and well-trained in map reading, are employed to seize a part of the road from the enemy. This initial seizure is simply to establish control before the beginning of the main attack, which will be made against the rear of the enemy defenses. This main attacking force may be divided into 3 detachments: (a) the initial striking force which secures a strip of road (not more than 400 to 600 yards should be necessary for a battalion attack); (b) a second force which attacks the enemy's rear immediately upon seizure of the road; (c) a reserve which may be used either to exploit the action of the second force or to relieve the first if the latter has lost too heavily in its initial encounter.

The success of such an attack is dependent primarily upon supplies and speed, for there can rarely be assistance from supporting arms. Consequently, the point selected for the attack in the enemy's rear should provide good cover for the unsupported infantry.

In the jungle the frontal attack is normally made on a narrow front, astride a road. It is designed to exploit the fact that all control is concentrated along the road, and is executed with a relatively narrow artillery barrage, usually extending about 200 yards on either side of the road. One of its advantages is that it allows for greater use of artillery. The use of tanks will be effective only if the enemy is insufficiently supplied with antitank guns, and if the attacking infantry follows very closely behind the tanks.

To achieve the best results the British believe that this attack should be combined with infiltration on the flanks of the main attack. These infiltrating detachments should be given objectives well to the enemy's rear, such as bridges or ammunition dumps.

h. Defensive Tactics

The defense, as stated, is inevitably hampered in jungle warfare. In the face of greatly superior enemy forces, when it is not possible to seize the initiative at once, the object must be a system of defense which will kill the maximum number of the enemy, but above all which will maintain the defending forces as a unit. Only by maintaining control is there any hope of reducing the enemy's numbers to the point where a counterattack can be launched. The static defense is as worthless in the jungle as in the desert, and the British now believe, for example, that the only way to hold a position for a prearranged number of days is to meet the enemy sufficiently far forward so that the delaying actions will last for the number of days desired. To apply these tactics requires troops of the highest caliber, for their morale will inevitably suffer in a series of even short withdrawals, and the tendency will be for smaller units to withdraw before they are ordered to do so.

Since control of the roads is the objective of both the forces, defense must take the form of a series of zones of resistance located in depth down the road. In successful defensive action in Malaya, battalion depth was about 2 miles and regimental depth up to 6 miles. Above all, the enemy must not be allowed to get completely in the rear of the defensive positions. Company defense areas are about 300 yards in diameter; and within platoons, squad defense areas should be about 100 yards apart. Squads themselves are usually dispersed in 2 or 3 groups, 30 yards from one another.

In order to conduct a defense successfully, normal Japanese tactics must be studied. The Japanese usually make initial contact on a road, with the objective of finding and containing the front line troops, as a preliminary to encirclement. Since this initial contact is made with considerable speed and at the expense of ordinary security measures, their leading formations are particularly vulnerable to ambush. A normal Japanese leading detachment would consist principally of a group of 4 or 5 bicyclists, followed at several hundred yards by another group of 60 or more bicyclists. After the forward group is allowed to pass, a successfully camouflaged ambush should be able to wipe out the large group following. Another type of ambush for these forward Japanese troops might consist of placing fairly strong, well-camouflaged forces on the flanks of a road, some distance in front of the other friendly positions. The Japanese are allowed to make contact, and to bring up their troops for the holding attack and subsequent encirclement; they may then be struck from the rear by the forward troops on the flank.

i. Counterattacks

The Malaya fighting indicated that in the jungle immediate rather than

deliberate counterattacks were required. Counterattacks were invariably unsuccessful when ordered by higher command since the situation had nearly always changed, usually for the worse, by the time the attack was launched. On the other hand, immediate counterattacks by reserves of forward units were nearly always successful. One general type of counterattack proposed for the future is as follows:

When the enemy makes contact, the leading defending battalion immediately withdraws. The enemy is then allowed to push forward to a bridge, village, or other vital feature. At this point a surprise frontal attack is made. This method has the advantage of not breaking up the main body to place counterattacking units on a flank.

_j_. Patrols

The British believe that in the jungle, fighting patrols, rather than mere observation patrols are always desirable. Patrols should aim to kill as many of the enemy as possible, giving information to their commander by "reporting by fire." This is based on the belief that events move so quickly in the jungle that a patrol which waits to report enemy movements on its return will invariably be giving stale and incorrect information. Patrols should also be considered as one of the best means of locating and disorganizing enemy encirclements during the approach march. Finally, the British believed that only small patrols can achieve the requisite mobility, and they recommend a patrol of one leader and two others.

13. TANKS IN NIGHT ACTION

The following report is from an article by two Russian officers in Red Star, an official Russian newspaper. It describes how a German regiment was dislodged from a strong position during night fighting.

* * *

Until very recently the extent of night tank action on the front has been limited to night marches, negotiation of water obstacles, and movement to jump-off positions for attack. On the field of battle, the tanks participated only from dawn to dusk. The opinion prevailed that at night the tanks were blind and would therefore lose direction, bog down in natural and artificial tank obstacles, and would not be able to conduct aimed fire. However, recent battles on one sector have shown that the effectiveness of night tank action is well worth the difficult preparations involved. The following is a report on one night action.

An enemy regiment had defended two important hills for some time. From these hills, he had good observation of our positions, which were on the far side of a river. Our positions were continually kept under effective fire. The attempts of the Soviet infantry to capture the hills were in vain.

The commander decided to attack at night. Under cover of darkness, a tank unit was ferried across the river, and concealed in a grove. The following day was spent in reconnaissance, and coordination and establishment of communications. The commander decided to send the tanks on a flanking movement from the south and the southwest, in order that the impression would be created in the enemy that they were surrounded by a large force.

The tanks were echeloned in depth. The heavy tanks were in the first echelon, the light tanks with "desyanti" (infantry mounted on tanks -- see this publication, No. 3, p. 44) were in the second echelon, and in the third echelon were tanks hauling guns. The shells for the gun were carried on the tanks.

Three minutes before the attack, the artillery fired an intensive preparation on the front lines of the enemy, and then shifted to the rear, concentrating on the possible avenues of retreat. Zero hour was 30 minutes before dark. In these 30 minutes the tanks moved from the jump-off positions, reached the Soviet infantry positions, and moved out.

A full moon aided observation. After crossing the line of their own infantry, our tanks opened fire. The flashes of the enemy guns, and flares discharged by Soviet infantry aided fire direction.

The enemy artillery conducted unaimed, disorderly fire, and often shelled their own infantry. Pressed from both the flanks and the front, the enemy started a disorderly retreat. In 4 hours of battle, our tanks and infantry took full possession of the enemy strongpoint. After that the tanks maneuvered along the south and southwestern slopes of the hills, enabling our infantry to consolidate their positions. When it became evident that the hills were securely occupied by

our infantry, the tanks returned to a grove to refuel, take on more ammunition, and be inspected.

The German dead, the equipment left on the field of battle, and the prisoners captured that night gave proof that the night attack was a complete surprise to the Germans. The impression of complete encirclement was created, and enemy officers and men scattered in all directions. The enemy attempted a few counterattacks, but they were all beaten back.

In the following days, a few more night attacks were made on this and other sectors of the front. They were all successful and resulted in very few losses in Soviet tanks.

From the experience of these battles, the following conclusions can be drawn.

(a) The attacks must be made on moonlit nights, when the infantry can orient itself and give the tanks the signals necessary for them to maintain direction.

(b) The tanks must be used in echelons. This allows movement on a comparatively narrow front, and creates an exaggerated idea as to the number of tanks in battle.

(c) Having occupied a certain line, the tanks must continue their maneuver so as to enable the infantry to consolidate its positions.

(d) During the attack, the tanks must under no circumstances be separated from the infantry. The tanks need the help of the infantry at night more than in the daytime.

14. LESSONS FOR ARMORED UNITS

The following report is from an account of the operations by a British armored brigade group in the western desert during August-September, 1942. The lessons emphasized below are believed to be some of the essentials for successful desert operations.

The antitank regiment of the group was found invaluable in holding battle positions. The brigade commander was responsible for the siting of antitank guns in the brigade area, and for coordinating the antitank defense with units on either flank. He was also responsible for the inclusion of antiaircraft guns of the brigade in the antitank defense plan. The antitank regiment was invaluable when used as a screen to cover the movement of the armored vehicles.

A semicircular screen of mines, some 300 or 400 yards in front of the bivouac area, gave great confidence in the ability to hold off any surprise night attack by enemy armored vehicles. The minefield was not marked or dug in, and was removed by engineers just before daylight. It is not known what number of antitank mines were used in the semicircular minefield, but when a complete circle of mines is required, some 3,000 to 4,000 mines will be necessary.

During daylight, given a good field of fire, small-arms fire from tanks can protect antitank guns from enemy infantry. At night, however, this cannot be done, since the tank is very vulnerable, and must be withdrawn out of range of enemy patrols. It is the infantry therefore that must provide the necessary protection at night for both tanks and antitank guns.

MEDICAL

15. TREATMENT OF WAR WOUNDS IN THE MIDDLE EAST

In the course of the six campaigns which have been fought over the Western Desert since September, 1940, British medical officers have had a great deal of practical experience with the treatment of war wounds. The following summary of the surgical conference held recently by the Director of Medical Service, Middle East Forces, and attended by a majority of the experienced surgeons in the Middle East is believed to represent the general trend of surgical thinking in this area on this important subject.

a. Surgery in the Forward Areas

This question brought up several interesting problems. Generally speaking, it is much better to operate where a patient can be retained for a suitable, if brief, post-operative period rather than make him travel within a few hours of the operation. On the other hand, in active desert warfare (and the experiences related were mainly in connection with the second Cyrenaican campaign), the time lag between infliction of the wound and arrival at a forward surgical unit is commonly more than twenty-four hours. Most cases are therefore best passed to the rear early without interference, and the work of the advanced mobile surgical teams becomes mainly that of "life or limb surgery." Into this category fall severe hemorrhage, penetrating abdominal wounds, sucking chest wounds, and devitalized limbs. Primary suture of wounds came in for universal condemnation. The still somewhat prevalent practice of tight plugging of wounds with gauze and an over-liberal dose of vaseline was also deplored. The rest of this discussion was concerned chiefly with the organization and equipment of mobile teams.

b. Penetrating Wounds of Chest

A trend from the more radical procedures of the last war to a more conservative attitude was the most striking feature of the discussion. In hemothorax, although the ideal treatment is early aspiration with air replacement, the best procedure in forward areas under prevailing conditions is simple wound toilet only and evacuation, provided the base hospital is likely to be reached within a week. The great majority of patients with hemothorax do not exhibit dyspnoea at rest and travel well. In a minority, early aspiration is required. The risk of infection is greatly lessened by the oral administration of sulfa drugs along the line of evacuation, and by delaying aspiration until it can be done under optimum conditions at the base. Removal of intra-thoracic foreign bodies is rarely necessary in forward surgery; even for later removal the indications are probably few.

c. Early Treatment of Burns

There was much adverse criticism of tanning procedures in forward areas, since sepsis, often severe, is an almost invariable sequel. Other local applications advocated were sterile vaselined lint strips (with or without dusting of the area with sulfanilamide or sulfathiazole), picric acid, saline compresses, and cod liver oil. Even the value of tanning in base areas was doubted by some. It seems there is little to choose between the various methods of local treatment of first and second degree burns so long as a high standard of cleanliness can be maintained.

d. Open Fractures of the Femur

Not only in this discussion, but in several others there was both great commendation of the value of the Thomas splint and criticism of its not infrequent faulty use and application. The standard Thomas splint technique described in the Royal Army Medical Corps training manual covers all the points raised, but re-emphasis is needed on one or two points. In first aid and during evacuation, only enough extension should be applied to assist immobilization. It is the comfort of the patient, not the reduction of his fracture, that is all-important until he reaches the base. Skin extension strapping should take the place of first aid clove hitches, halters, skewers, and foot clamps, and the sooner the better. A common fault in applying the splint has been looseness and faulty padding of the upper ring. The leather ring should not have superadded padding, and stability must be maintained by a long immovable pad between the outer part of the ring and the thigh. Too often this pad does not retain its position during transport. A long pad of firmly bandaged wool is advised for this. Adequate fixation of splint to stretcher is also highly necessary for proper immobilization. Fixation of limb to splint by encircling plaster of paris bandages is helpful, but sores or worse are apt to develop if the limb is insufficiently padded. Splitting the plaster when set is the safest course. The plaster of paris hip spica was mostly condemned as an immobilizing agent in evacuation.

To return to the compound fractured femur, it still remains one of the greatest problems of war surgery. Treatment of initial shock, provision of ample dependent drainage at the initial operation because of the depth of the lesion, and comfort during evacuation are life-saving measures which far outweigh in importance the position of the bone fragments.

e. Penetrating Wounds of the Knee Joint

Some guiding principles were laid down. In the past, through-and-through gunshot wounds with small entrance and exit apertures were not excised at all; it is impossible to be thorough with the whole tract. More extensive wounds frequently reach the surgeon after a delay which precludes proper debridement. Then the only necessity is to ensure adequate drainage. The surgeon at the base is often confronted with the problem as to whether a joint is or is not infected on the arrival of the patient a week or two after infliction of the wound. Thorough immobilization and expectant treatment for a few days is probably the best course at this juncture. All are agreed on the necessity for extensive incisions once the joint has to be opened. To prevent gravitational spread of pus into the thigh, it is wise to lower the limb till the heel is just off the bed.

f. Emergency Amputations

The indications for primary amputation (i.e., on or about the first day) are quite straightforward and generally agreed upon. But they are not so easy at a later date. Amputation for infection is a most difficult decision. Greater risks can be taken in upper limb cases, firstly, because the upper limb is so much the more precious, and secondly, because septic absorption is so much less marked than in the lower. There was some little disagreement in the discussion as to whether secondary hemorrhage should be such a relatively frequent indication for secondary amputation. There are infrequent cases of secondary hemorrhage unassociated with bone damage and with but slight sepsis. For these, local ligature at the most is sufficient. In the more common form, associated with gross bone or joint sepsis, one point of view was that amputation is too quickly resorted to, the other was that lives are lost by undue delay. A general working rule adopted by most was as follows: expectant treatment, with minor local measures, for any initial small hemorrhage; local, or if impossible, proximal, ligature for the first large hemorrhage; and amputation for a second large hemorrhage. Stressed and restressed by speakers was the necessity for saving every possible inch of limb on amputation. There is no telling how much the inevitable sepsis in war conditions will eventually further shorten the limb. Sites of election do not exist in war surgery. To anticipate the sepsis, most prefer not to perform the guillotine operation, but to cut flaps and either sew these back temporarily or insert stitches which may be tied after a few days. Early skin traction is useful. When decisions have to be taken regarding the upper limb it is well to remember that a few stumps of thumbs and fingers are better than the best prosthesis.

g. Wounds of the Upper Face

The audience at this meeting was reminded that the skin of the face is too precious ever to be excised in wound treatment and that because of this, and to avoid possible later powder and tattoo marks, such wounds must have a more thorough cleansing than others. Any piece of bone with soft tissue still attached must be retained, firstly because its recovery is probable, and secondly because its removal causes deformity. Suturing of facial wounds is indicated only where the wound is recent, where there is no loss of time, and where fine needles and sutures are available. Otherwise it is best simply to apply a sulfanilamide, tulle gras, and saline dressing, and to transfer the patient to a plastic surgery center. In plastic surgery, any attempts to close a gap where there is loss of tissue must be resisted. Big stitches under tension lead to serious sepsis and irreparable scars.

Protection of the cornea is the principle underlying treatment of wounds of the eyelids. A sulfanilamide dusting, tulle gras and saline dressing is advised, and twice daily the eye is irrigated with normal saline and liquid paraffin drops instilled. Vitreous loss is the greatest danger to the future integrity of the eye after penetrating wounds. Such patients should be kept lying and not treated as walking wounded. The risk of sympathetic ophthalmitis in eye wounds is almost negligible up to nine days, and patients therefore should be sent back to have major operations in the best possible surroundings..

h. Wounds of the Head

When head wounds are seen early (up to about thirty-six hours after receipt), closure is advised after cleansing with a stab drain down to the bone only. In heavily infected cases, seen several days later, gentle cleansing should be done; the removal of any superficial pieces of bone then will also help remove highly infective material such as hair and dirt, which also prevent drainage. Although more a matter of argument, there is a good case for the closing of these late wounds also; since protection of the brain is so important. The large potential space for effusions between scalp and bone is a great safety factor, and the scalp has tremendous powers of healing. Routine lumbar puncture on the second or third day not only relieves pressure but gives a good idea of what is happening within the skull. Only a minority of indriven fragments and metal causes abscesses; interference with these should therefore be limited.

i. Treatment of Infected Wounds

Great tribute was paid to the value of blood transfusion for patients with severely infected wounds, especially in the chronic suppurative stage, and also even earlier. Such transfusions must be large, even massive, in amount. Most agree that one large transfusion is better than repeated small ones. The loss of plasma proteins in copious discharges raises the question of making good its loss, and this was described as best accomplished by a T.B. diet with fresh fruit and plenty of fluids.

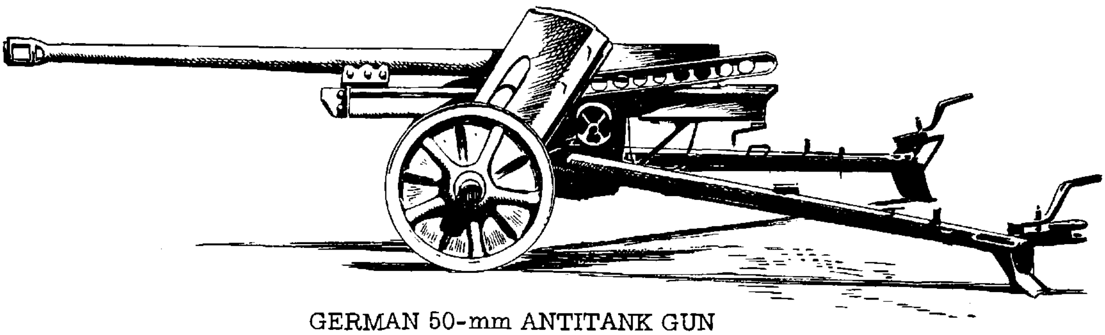
A case was presented for less conservation in dealing with these infected wounds and for a return to irrigation procedures. The solution advocated is 0.25 percent electrolytic sodium hypochlorate. This is diluted ten times for continuous irrigation, only twice for intermittent lavage. Many of those present seemed content with dressings consisting usually of a powdering of sulfanilamide, a layer of tulle gras, and a covering of saline gauze.

There is some evidence to suggest that improved drainage plus Proflavine (powder) has been instrumental in clearing up resistant infection (usually staphlococci) in late stages.

16. GERMAN 50-MM ANTITANK GUN 38

a. General

This weapon was introduced in 1941 to replace the 37-mm antitank gun. It is one of the most effective German antitank guns at present in service. The following sketch illustrates this gun.



GERMAN 50-mm ANTITANK GUN

The barrel is of monobloc, loose-barrel construction, and is fitted with a muzzle brake.

The carriage is of the split-trail type, and is carried on solid rubber tires 31 1/2 inches in diameter. There is a third detachable wheel to increase the speed of bringing the gun into action.

The shield consists of two 4-mm sheets of armor plate spaced about 1 inch apart. The left side of the shield has a sighting port.

The gun is normally towed by a half-track. There is also a self-propelled type. Recently, the gun, without a muzzle brake and electrically fired instead of by percussion, has been mounted in the latest type of Mark III tank.

The gun fires AP shell, and AP 40 shot. The latter is a light shot with a ballistic cap and a tungsten carbide core, which has a good armor-piercing performance at ranges under 500 yards. The following table gives the complete data on the three types of ammunition.

Type	Weight of complete round	Length of complete round	Weight of projectile	Fuze	Identification
AP tracer shell	9 lbs 3 oz	21.4 in	4 lbs 9 oz	Base	Projectile black
HE shell	7 lbs 3 oz	23.7 in	3 lbs 15 oz	Nose	Projectile dark green
AP 40 shot	-----	-----	2.025 lbs	-----	Projectile black

The following figures show the penetration of the two different types of armor-piercing shells.

(a) AP shell:

60-mm (2.36-in) homogeneous plate at 250 yards at 20°;
60-mm (2.36-in) homogeneous plate at 1,300 yards at normal.

The above figures are probably conservative, and were deduced from trials with a limited supply of ammunition.

(b) AP 40 shot:

90-mm (3.54-in) homogeneous plate at 330 yards at 20°.
64-mm (2.54-in) homogeneous plate at 440 yards at 20°.

The above figures are unconfirmed.

b. Particulars

Muzzle velocity (AP)	2,740 f/s
Muzzle velocity (AP 40)	3,940 f/s
Muzzle velocity (HE)	1,800 f/s
Maximum range (HE)	2,640 yds
Maximum range (AP)	1,540 yds
Maximum range (AP 40)	770 yds
Effective range (AP)	1,000 yds
Effective range (AP 40)	500 yds
Effective range (HE)	2,000 yds
Rifling	21 grooves, twist 1 turn in 32 cals
Depression	-18°
Elevation	+27°
Traverse	65°
Weight of complete equipment	2,016 lbs

17. GERMAN MOBILE TRUCK MAINTENANCE COMPANY

According to a prisoner of war, the Germans have employed in North Africa a special mobile maintenance company, used solely for the repair of trucks. The company has a strength of about 100 officers and men. It is fully motorized, being equipped with 15 vehicles; two of these vehicles are machine-shop trucks which are equipped with lathes, drilling machines, and welding equipment. The unit, while equipped with trucks fitted with cranes, very seldom performs recovery functions. Repairs are carried out in a large tent in which there is sufficient room for the company's 20 machinists to work at once.

18. U.S. RATIONS AND KITCHEN EQUIPMENT UNDER DESERT CONDITIONS

Recently, the British forces operating in the Middle East theater, were given the following American rations and equipment for testing: 24 "K" rations, 6 packages of "M" rations, one 2-piece enameled cooking-utensil, and one portable pressure stove. The results of the field tests under desert conditions are noted below.

The "K" ration was well received. Several features responsible for this satisfaction were: its excellent waterproof packing, high food value, variety, absence of waste connected with its use, and the attractive way in which prepared. The only serious questions raised concerning its fitness for use in the Middle East were its availability and the date of the canned foods.

Specifically, the report of a tank crew that used the ration was that it satisfied all hunger and energy needs, was appetizing, nothing was wasted, no ill effects were noted, the packing protected the contents from sand and oil, and the weight and size of the ration was less than the one customarily used. The only unfavorable reaction was the increased thirst resulting from eating the biscuits and graham crackers. In view of the fact that these crews were on one-half gallon a day water rations for drinking and washing, this is a serious complaint

The comments concerning the "M" ration in general are that the packing is excellent, stands up well in transport, and under usual conditions its contents are adequately protected. The lemonade powder had attracted moisture and became hard and difficult to use. All other ingredients were in good condition for use. The amount of water required, and the time required to cook a meal, detract considerably from its value as a ration in this particular theater.

The cooking utensils proved to be an excellent set of compactly packed and easily cleaned utensils.

The portable pressure-stove was a failure. The chief defects observed were the absence of a wind screen, and the small size of the pressure chamber. In the desert, a stove must have a wind screen of some sort to prevent the flame from being blown out. Pressure could not be maintained for more than 30 seconds, and this required the attention of one man for continual pumping. The fuel used was unleaded, 70 to 80 octane gasoline. The fuel jets were frequently clogged from sand and oil.

19. REPORTS FROM THE FIELD ON PERFORMANCE OF EQUIPMENT

No piece of equipment can be said to be satisfactory until it has successfully met the test of combat conditions. Also, relatively minor modifications of equipment may greatly improve its performance. The man actually using the equipment is one of the best sources for determining its quality and ways in which it can be improved. In order to tap this source, the German High Command on April 17, 1942 issued the document set forth below. It will be noted that soldiers

who think they have useful suggestions to make are to communicate them directly, and not through the usual channels.

* * *

To Army Groups, Armies, Corps,and Divisions for Distribution down to Battalions.

War demands continual improvements in weapons and equipment. New ultra-modern weapons are now being produced. These will show the world our superiority to the enemy in armament also.

To hold this advantage, and if possible even to increase it, is an important condition for final victory.

The basis for the creation of new weapons and for every improvement in existing equipment must be the practical experience of the front-line soldier. He actually realizes the advantages and disadvantages of his weapons and equipment, and knows best the requirements of battle. The quickest possible interpretation of this front-line experience and its immediate utilization in armaments production must be ensured. The Minister for Armaments and Munitions has set up a special board to test immediately all practical suggestions and proposals from the front for the improvement of our weapons and the invention of new ones, and to pass them on to the actual manufacturers.

Any soldier who thinks that he can make any useful suggestions or proposals in regard to weapons and equipment on the strength of his experiences in battle is authorized and ordered to communicate them direct, and not through the usual channels, to the

Headquarters of the Armed Forces
Army Branch.

This order is to be repeated to all front-line troops.

Signed: Adolf Hitler.

20. GERMAN WIRE COMMUNICATION IN NORTH AFRICA

The following report was made after observation and inspection of the system of wire nets used by the Germans in North Africa.

a. General

The German use of wire communication is very flexible, and the extent of use varies according to the time available, conditions, and the tactical situation.

At periods when the troops are not engaged in active operations, a complete wire net is laid, and radio is used only by forward patrols and as an emergency means in case of interruptions and excess traffic over the wires.

Wire is not used as a means of communication during periods of inactive operations when mounted messengers are available. In forward areas, the Germans take every precaution against interruption of messages sent over the wire nets.

It is definitely known that in at least one German battalion, the orders issued to it specified that operational traffic was to be sent by telephone or telegraph until the latest possible moment: i.e., until the lines were cut by enemy action, and only then was radio to be used.

The following notes concern the wire network of the German Afrika Korps from June to October 1941. During this period there were no important operations; hence, what follows probably shows the fullest extent to which wire has been used in Africa by the Germans.

b. Wire Nets

The wire nets for a large unit like the Afrika Korps may be divided into four classes.

(1) Local lines to the individual staff officers, corps headquarters, and communications personnel.

(2) Lines direct to lower units, corps troops, corps artillery, etc., which are controlled directly by corps headquarters.

(3) Lines to the main units (divisions) under the command of the corps headquarters. These units themselves had large switchboards, through which corps headquarters could communicate directly with the regiments and battalions of the particular division.

(4) Lines to large centrals at fixed geographical points, such as Capuzzo, Gambut, and Gazala. These centrals were not in any unit headquarters, but provided a medium whereby corps headquarters could contact organizations not directly connected with it.

It must be noted, however, that there is no very clear distinction between (3) and (4) above. There are frequent instances of division switchboards acting as intermediaries between corps headquarters and non-corps divisions, or even of fixed centrals doing this, in addition to their normal function as the central exchange for their own regiments. Thus, in July and early August, the Trento Division switchboard carried the Afrika Korps communications to the Afrika Korps headquarters' switchboard at Gambut and Acroma, and to other Italian divisions such as the Brescia and Pavia (none of the Italian divisions belonged to the Afrika Korps.) In June, the Afrika Korps actually had no direct wire to the German divisions under its command. These were contacted through the Trento switchboard. Similarly, in September, the Bologna Division had nearly all the German heavy artillery units as subscribers, while at the same time the Afrika Korps headquarters' switchboard provided wire to the XXI Italian Army Corps, the Brescia and Littorio Divisions, and fixed centrals at Acroma and Gazala.

Furthermore, no distinction is made in the circuit diagrams between unit switchboards and fixed centrals.

Another interesting fact about the function of unit switchboards is that comparatively minor units frequently had more important units as subscribers. In August, for example, in the 15th Armored Divisions's wire net, the 1st Battalion, 33d Flak Regiment was the central for both the 15th Motorcycle Battalion and the 104th Motorized Infantry Regiment.

c. Extent of Afrika Korps Wire Communications

The comprehensive wire net developed after a period of static warfare can be shown by taking each of the four categories separately.

(1) Local Switchboard

In July there were some 21 lines from the Afrika Korps staff switchboard. The subscribers were either individual staff officers, or the officers of the various sections of the staff. Five or six additional lines were used for communications personnel (wire maintenance sections, etc.).

(2) Lines Direct to Corps Switchboards

The number of these lines varied according to circumstances. At one period in December, the Afrika Korps seems to have been acting as a fixed exchange for the Italian division at Bardia, and this involved a number of extra lines to installations and detachments. Normally, however, there were about six of these lines, and the units served were AA batteries protecting the headquarters, corps signal battalion, the intercept company, the air cooperation headquarters, and at some periods a reconnaissance unit and an airfield.

(3) Lines to Unit Switchboards

These lines again varied considerably. In June, 1941 the Afrika Korps had no direct lines to its own divisions. Instead, these were contacted through the Italian Trento Division. In October, there were direct lines to switchboards of all three German divisions, and the corps headquarters, while all Italians units were contacted through fixed centrals.

(4) Lines to Fixed Centrals

Early in the period the Trento Division acted as the most important fixed central in the network, and the corps had direct lines also to central exchanges at Gazala and Acroma. During July and early August, the Trento Division and Capuzzo were the only centrals (apart from those of the German divisions) to which the Afrika Korps was directly linked. In mid-August the Bologna Division took over the complete role of the Trento Division. But in September and October, Afrika Korps had direct lines to two fixed centrals, Gambut and Capuzzo, which acted as intermediaries to all units not on the German division exchanges. These centrals correspond with the "North" and "South" sectors into which the Germans divided their main defensive area.

In the final stage of development of this network, after 3 months of position warfare, Afrika Korps had local lines for its various staff sections and staff officers, direct lines to six or seven corps troops units, lines to the switchboard of the corps headquarters, and of all three German divisions, whence lower echelons and units could be called, and finally lines to two large fixed centrals at Gambut and Capuzzo through which they could contact the main Italian units, smaller fixed exchanges, and other German units not covered by the corps wire net.

d. Divisional Wire System

A similar development is shown by the circuit diagram of the 15th Armored Division for the same period. There was a staff switchboard with up to 20 lines: direct lines to small units (AA, communication, medical companies, etc.); lines to main units, whence smaller organic units could be contacted; and lines to main exchanges like the Afrika Korps, or to Gambut for rear and lateral communications.

e. Subsequent Examples

Another circuit diagram showing the communications of the 155th Light Infantry Regiment from April 20, 1942 is interesting as an example of the German wire system.

The Afrika Korps had moved shortly before the date mentioned above, and from the new position had communications only with the 15th Armored Division, 109th Motorized Infantry Regiment, and an Italian division. The old switchboard had not been moved, and was connected to the new one through a fixed central.

This central and the old corps switchboard together provided the new installation with a means of communicating to the 21st Armored Division and other units.

The 90th Light Division, the unit to which the 155th Light Infantry Regiment was attached, had communication to the rear only to the XXI Italian Army Corps, to which command it was at this time attached. No lines to the front were shown from the 90th Division, and a radio net including the 155th Light Infantry Regiment is shown on this circuit diagram.

The 155th Light Infantry Regiment was amply supplied with forward wire lines, but had none to the rear except indirectly via a battery of the 611th Antiaircraft Battalion to the 104th Motorized Infantry Regiment, and thence to the Afrika Korps. The 155th Light Infantry Regiment had the following wire circuits:

(1) A staff switchboard with lines for the regimental commander, adjutant, signal detachment, observation post, etc;

(2) Lines from the switchboard terminating at telephones to the supporting artillery troops and antitank units;

(3) Lines to switchboards running to the two battalions of the regiment simplexed for telegraph.

The battalions had their own local staff lines and lines direct to company headquarters.

f. Forward Wire Communications - Infantry Battalion

Two circuit diagrams of the 1st Battalion, 115th Motorized Infantry Regiment, dated May 27 and June 16, 1941, respectively, show the wire net of an infantry battalion in the front line in Libya.

The earlier diagram shows rear and lateral lines from battalion headquarters to regimental headquarters, a neighboring battalion, and an artillery battery. On the later diagram there is an additional line to the 2d Battalion, 115th Motorized Infantry Regiment. On both dates, the line to regimental headquarters was simplexed for telegraph.

Communications within the battalion were, at the earlier date, as follows: lines from battalion headquarters to 1 and 3 Companies, and radio communication to 2 Company. Both 1 and 3 Companies had lines to 2 Company, and each company had a line to an attached mortar or machine-gun section. In addition, battalion headquarters had lines to two observation posts manned by elements of the heavy weapons company, and from one of these, there was a line to a platoon of the cannon company.

By June 16, the three companies had been compressed to two, a "Left" Company and a "Right" Company, each with one platoon in front. Lines to platoons and sections of the heavy weapons company no longer went back from

company headquarters, but forward from rear observation posts, and an additional line was provided from battalion headquarters to an engineer platoon. The radio net from battalion headquarters to 2 Company was no longer shown.

The 33d Artillery Regiment's wire communications were shown in a circuit diagram to be as follows:

(1) A switchboard with a line back to division headquarters, and local lines to the staff officers;

(2) A second switchboard with lines to each of the three battalions and to the observation posts.

Radio was used for communication between command vehicles of the regiment, and the battalion commanders and observation officers in tank-supporting artillery units; wire cannot be used for these purposes.

GENERAL

21. SUMMARY AND EVALUATION OF OPERATIONS IN EGYPT

October 23 to November 7, 1942.

a. Summary of Operations

On October 23, Axis armored divisions were disposed in two groups as follows: the 21st Panzer and the Italian Ariete in rear of the south end of the line; the 15th Panzer, the Italian Littorio, and the German 90th Light (less certain reconnaissance elements), in rear of the north end of the line.

Beginning October 27, the Axis armored forces which had been concentrated in the north counterattacked vigorously, particularly against the north end of the British line. This was unsuccessful due to prior Axis losses and stiff British resistance.

On October 30, the 21st Panzer Division moved north and joined the 90th Light Division and the two armored divisions in that area; the Trieste Division (motorized), the only available reserve on the entire front, was committed in the north.

By the morning of November 1, the British completed regrouping the X Armored Corps, and in the evening the Corps attacked due west. The main effort of this attack was directed frontally against the 15th Panzer Division and the Italian Littorio (Armored) Division. Both of these Axis divisions suffered heavy casualties. The British attack penetrated into the Axis rear areas and isolated one regiment of the German 164th Division along the coast. The 21st Panzer Division at this time was also along the coast, west of the 164th Division. The Axis forces counterattacked desperately and lost heavily in tanks and antitank

guns in combat between armored units. Although suffering heavy losses, the 90th Light and the two German Panzer divisions with their depleted forces succeeded in withdrawing to the west.

A large proportion of the Italian forces in the south, lacking transportation, ceased resistance and they, together with miscellaneous German troops, were captured by the British XIII Corps.

b. Change in German Commanders

It is interesting to note that a change in German commanders during this period probably had a marked influence on the Axis conduct of the operation. At the beginning of the period, General Stumme was in command of the Afrika Korps in Marshal Rommel's absence. It was during his command that the Axis armor was split into two groups. On October 26, Stumme was killed in action and General Thoma took command. He initiated the concentration of his armored units for employment as a striking force.

c. Evaluation of Axis Tactics

Concentration of effort has always been a basic German tactical principle. It is almost axiomatic with German commanders to employ their armored units, specifically tanks, in mass to deliver hammer blows.

Hence it is difficult to understand why General Stumme divided his armored force into two parts, one south and the other north, without keeping an armored force in general reserve to deal with a British breakthrough. Perhaps terrain and lack of adequate facilities dictated his choice. Nevertheless, his reported disposition against an alert and well-equipped enemy possessing superior air power invited the Axis defeat that followed.

General Thoma's concentration of his armored forces apparently came too late. The British not only were prepared to take on the Axis counterattacks but they were able to renew the offensive at the proper moment, when the Axis forces were disorganized and expended as a result of these counterattacks.

d. Evaluation of British Tactics

Improvements in British tactics have been noted in the following respects:

(1) Intense and effective use of artillery against tanks and antitank guns.

(2) Judicious use of armored units concentrated for mass employment.

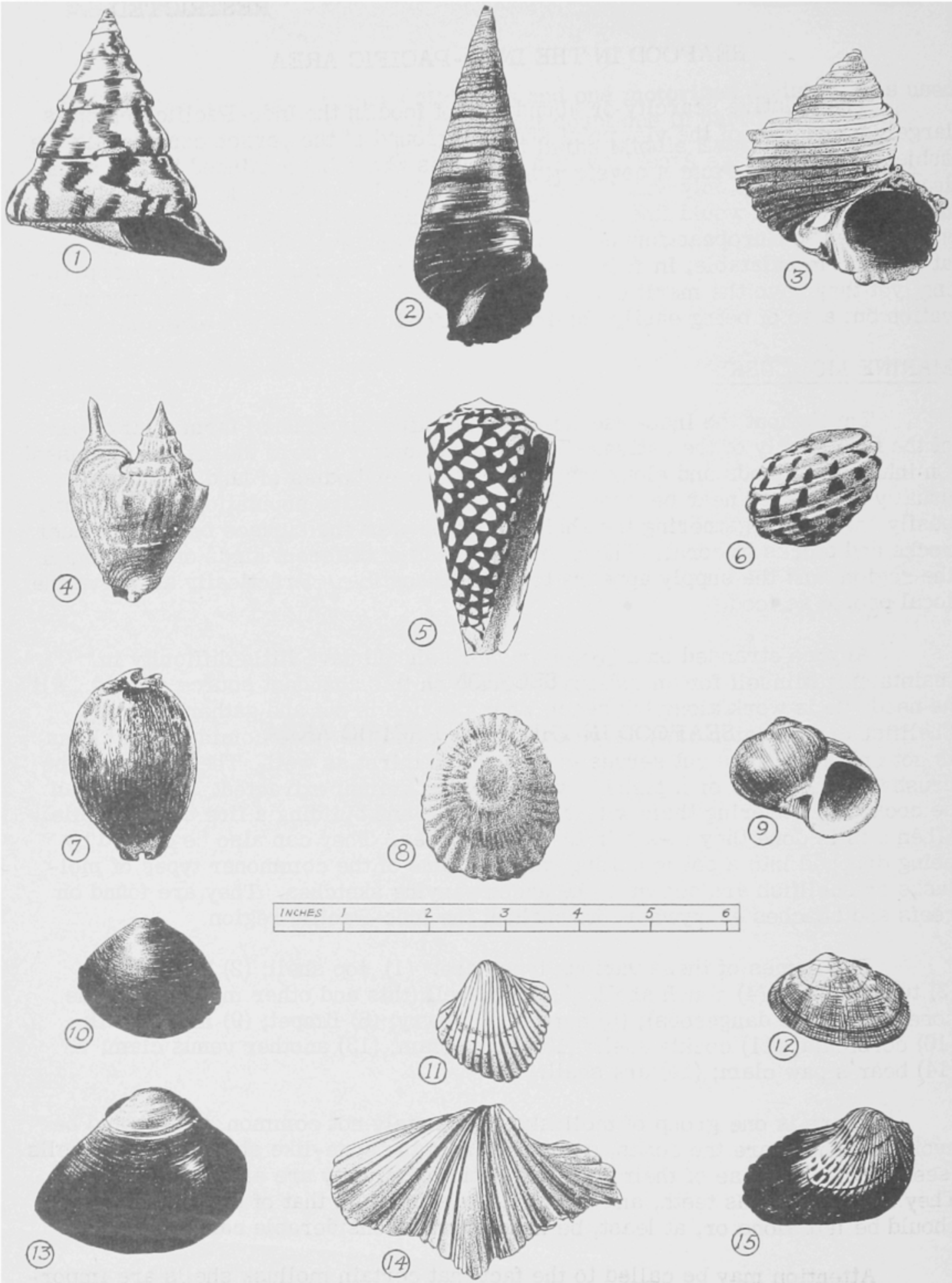
(3) Coordination between tanks and infantry movements.

The conduct of this campaign by the British was at marked variance with that of other desert operations. Previously, armored regiments, reinforced, were used independently as striking forces, but in this action the British X

Corps, composed of two armored divisions and one motorized division, was used as a unit. This change in tactics was without doubt due in part to the recent sweeping changes in British High Command in the Middle East; but lessons learned in previous desert operations probably played a more important part.

SECTION II

SEAFOOD IN THE INDO-PACIFIC AREA



SHELLFISH--INDO-PACIFIC AREA

SEAFOOD IN THE INDO-PACIFIC AREA

The relative scarcity or abundance of food in the Indo-Pacific region is largely a question of the viewpoint and background of the person considering the subject. The average American in most cases would be convinced that in some localities there not only was a scarcity but actually a total lack of food, while a native of the area would find plenty to satisfy his requirements. To the taste accustomed to European forms of food, many items available locally might not at first seem palatable, in fact would probably be regarded as wholly unappetizing; yet they have the merit not only of sustaining strength and preventing starvation but also of being easily obtained. Seafood is an excellent example.

MARINE MOLLUSKS

Throughout the Indo-Pacific area, shellfish (mollusks) form a large part of the food supply of the natives. This is particularly true of the marine mollusks. On inhabited islands and along the coasts of larger bodies of land, villages usually are placed near beaches. At ebb tide the native population will be found busily engaged in gathering the shellfish exposed on the surface or hidden under rocks and blocks of coral. There are hundreds of different kinds of mollusks in the region, and the supply appears to be inexhaustible. Practically all serve the local people as food.

Anyone stranded on a beach or shore should have little difficulty in maintaining himself for an indefinite period on this abundant source of food. All he need do is work along the beach when the tide is out and gather a supply. Shellfish can be eaten raw, as we eat oysters, and the juice coming from clams is not only nutritious but serves to quench the thirst as well. The shells can be crushed with a rock or a piece of wood and the animal extracted. Shellfish can be cooked by covering them with sand or earth and building a fire over the pile. When this is done they steam in their own juices. They can also be cooked by being dropped into a pot of boiling water. Some of the commoner types of mollusks or shellfish are shown in the accompanying sketches. They are found on reefs and beaches everywhere throughout the Indo-Pacific region.

The names of these various types are: (1) top shell; (2) horn shell; (3) turban shell; (4) conch shell; (5) cone shell (this and other members of the cone family are dangerous); (6) nerite; (7) cowry; (8) limpet; (9) moon shell; (10) corbicula; (11) cockle shell; (12) venus clam; (13) another venus clam; (14) bear's paw clam; (15) ark shell.

There is one group of mollusks, fortunately not common, that should be avoided. These are the cones, so named from the cone-like shape of their shells (see No. 5). Because of their characteristic form, they are easy to recognize. They have poisonous teeth, and their bite is similar to that of snakes. They should be left alone or, at least, be handled with considerable care.

Attention may be called to the fact that certain mollusk shells are important for other purposes. For example, the mountain tribes of the interior of New Guinea, especially in the western half of the island, regard cowry shells (No. 7) as the most valuable medium of exchange. They use the small shells,

those that are about three-quarters of an inch long and look much like a large-sized coffee bean. A man with a pocket full of them could obtain from the pygmy tribes located in that region all the necessities required to satisfy his wants for many months. These people have little regard for any other articles that might be offered for trade purposes. The pygmy-like tribes of the central mountains in the Dutch half of New Guinea are a friendly and helpful people. Even individuals may appear among them in safety. They are industrious agriculturalists, with considerable surpluses of taro, yams, and sugar cane that could be obtained by use of the cowry shells in barter. On the other hand, except for limited areas near the coast, the larger Papuan peoples of the lowlands and the northern mountains are likely to be dangerous to small parties of strangers. The money cowry is a beautiful shell, light-straw color above, and white at the sides and below. Most of the shells used for that purpose come from the Malabar Coast in southwestern India and from the Maldive Islands.

LAND AND FRESHWATER MOLLUSKS

Land and freshwater mollusks can also be used, but they are rather difficult to obtain. There are a great many forms, including the snails, occurring under different conditions. Some kinds are found only in the hills; others, in the valleys. Some prefer the recesses of the woods, and others the open meadows. Some varieties cluster around limestone rocks; others prefer sandy or clayey districts. Some live only in still or gently flowing waters, while others are never found except where the current is strong and rapid. All of these forms are edible and can be used in the same manner as the marine mollusks. It is safer if the freshwater forms are cooked before eating, as there is some possibility of pollution from the places that they inhabit. As a rule, however, the land and freshwater mollusks are so hard to find that unless a man happened to run across a concentration of them it would be a waste of time to try and locate them, especially since other forms of food are usually to be had.

CRABS AND LOBSTERS

In addition to the mollusks, crabs and lobsters are to be found in the crevices and among the rocks on reefs and rocky shores. Included among the crabs is a large swimming variety that is related to our Chesapeake Bay blue crab (they turn red on being cooked). This form is distinguished by the paddle-like shape of the last pair of legs. Crabs and lobsters can be caught at night, as that is the time when they generally move about. They may be stunned with a stick or stone, caught in the hands, or trapped. Traps baited with fish or animal flesh are commonly used by commercial crab and lobstermen, but probably would not be practical except in the case of more or less permanently established shore parties. A dip-net, fashioned by making a hoop from a shoot or small branch and interlacing strips of palm leaves or fibers, or a net made from an article of clothing, is most useful in taking these creatures. Spiny lobsters or sea crawfish do not have large pincers on their front legs, but do have "thorns" or spines on their backs. These can produce severe lacerations if seized by the bare hand. Hence the hand should be protected, if possible, by a stout glove or some equivalent. Spiny lobsters may be caught by placing a dip-

net behind them and, with the foot, touching their antenna, the long flexible processes projecting from their heads. This causes the creature to move backward quickly into the net or bag, which must be yanked up immediately. Crabs also occur in freshwater lakes and streams, both in the mountains and on the plains, and frequently travel about on dry land. Some, such as the purse-crab of the East Indies, may be found on the trunks of trees.

As far as is known, all crabs and lobsters, whether marine, freshwater, or the land forms, are fit for human consumption provided they are fresh. Salt-water forms can be eaten raw with little likelihood of bad effects, but all land and freshwater crabs should be thoroughly cooked. The land crabs, particularly in Asia and the closely adjacent islands, are infected with lung parasites that are often fatal to human beings if the crabs are consumed in an uncooked condition. The best way to cook crabs and lobsters is to drop them alive into boiling water. Thus there is no danger of decay before cooking, and they become sterilized at the same time. The shells and pulpy gills are easily removed after cooking. Most people insist that the gills (sometimes called the deadmen's fingers) be removed immediately. Actually they are harmless and will cause no trouble if eaten. They have acquired a bad name because they are about the first spot to spoil, but all danger of this is avoided by immediate cooking and eating.

SHRIMPS

Another source of food is in the freshwater shrimps that abound in all the streams of the Indo-Pacific area. There are two major kinds, the larger forms with an elongated second pair of legs, often called crawfish by those not familiar with the proper technical terminology, and a host of smaller varieties averaging about an inch in length. Commercially, shrimps are taken in various kinds of traps baited with fish and meat scraps. They can be caught in other ways, however, in sufficient quantities to furnish an ample supply. Along larger streams,in the shallow places near the shore where water is nearly stagnant, masses of small shrimps may be found swimming about and be taken with hand nets. Best results are obtained by people working in pairs and standing in the water. One drives the hosts of shrimps towards the other, who dips them out with the net. In some areas the natives will dam a shallow, narrow stream, making a fairly water-tight barrier of branches, sticks, large leaves, mud, and sand. As the section downstream runs dry, the shrimps stranded there or hiding among and beneath rotten pieces of wood, branches, leaves, in the crevices between the rocks, and among roots or other debris, are collected. Fish and crabs are often obtained at the same time. The best yield, however, comes from bailing dry the many pools and puddles still remaining in the bottom of the stream bed. Anything that can be picked up to serve as a scoop is used to dip out the pools, or small dip-nets are made on the spot for that purpose. Where bushes grow along the edge of a stream, and the branches droop down so that some of the twigs and leaves are in the water, large catches are sometimes made by lifting the branches out of the water and catching the shrimps as they drop off the leaves. This produces better results if it is done at night, as the shrimps seemingly leave the bushes during the day.

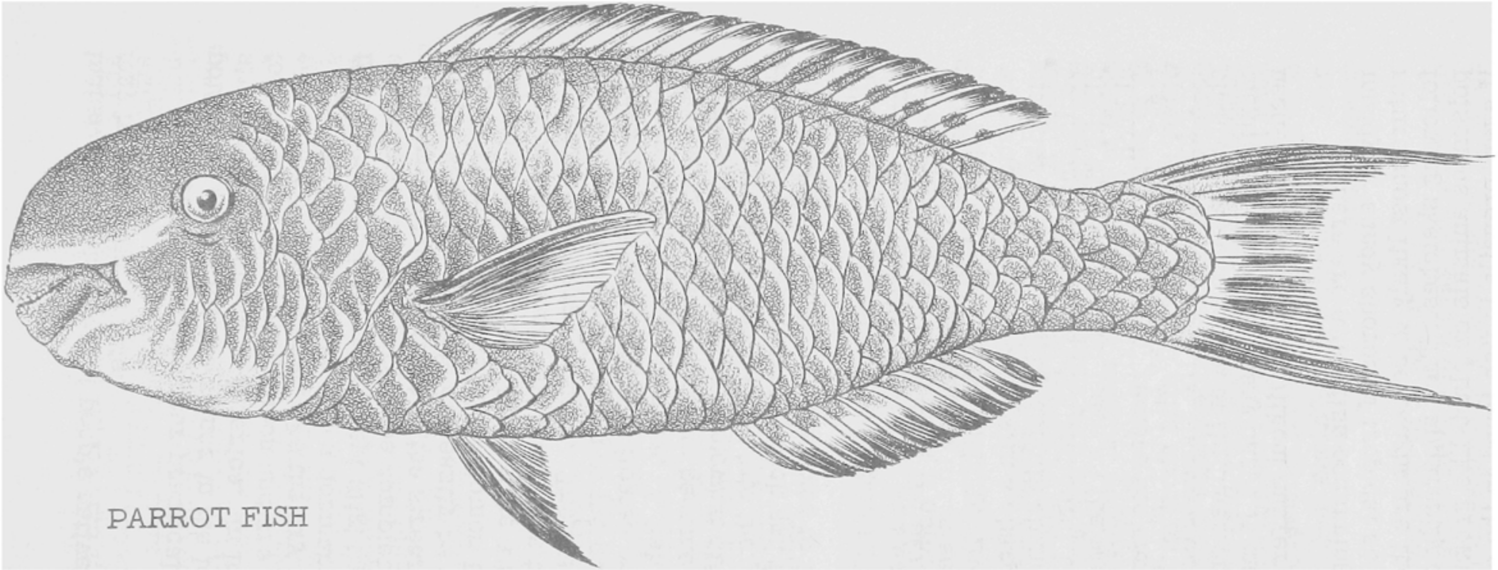
Shrimps usually are cooked by boiling. In the larger forms only the abdomen (the tail end) minus its shell is eaten. The shell is easily removed after cooking. The small forms make good soups or stews when cooked whole, but if they form too great a part of the diet and are eaten continually over a period of time, the shells may produce diarrhea. This can be avoided by straining the soups or stews before using or before adding some other bulky food substance.

Other small shrimp-like animals (the mysids, sometimes called opossum-shrimps) occur on both sides of the Peninsula of India in brackish water, lakes, and estuaries along the coast. They are particularly plentiful in Chilka Lake on the Orissa Coast, the east coast of India. Similar species, though perhaps in not as large numbers, should be found elsewhere in the Indo-Pacific region. The mysids swim in large shoals a short distance below the surface, keeping in the shadows cast by rocks or other objects. Each shoal has its own "beat" to which the majority of the members confine their movements. As a rule, each individual swims the whole length of the "beat" and turns when it comes to the end of it. Occasionally single members will turn at the halfway point, and some will now and then break away and swim out from the sides of the shoal, but they always return after going a short distance. The general tendency of the shoal is to move in an elongated figure eight. The "beat" is never more than one foot wide and may be from 3 to 6 feet long, its limits apparently being determined by the size of the shadows in which the shoal moves. The mysides can be caught by straining the water through a piece of cloth. The natives usually mix them with turmeric, obtained from the tuber or aromatic root of the turmeric plant, boil and dry the mass, and eat it with their rice.

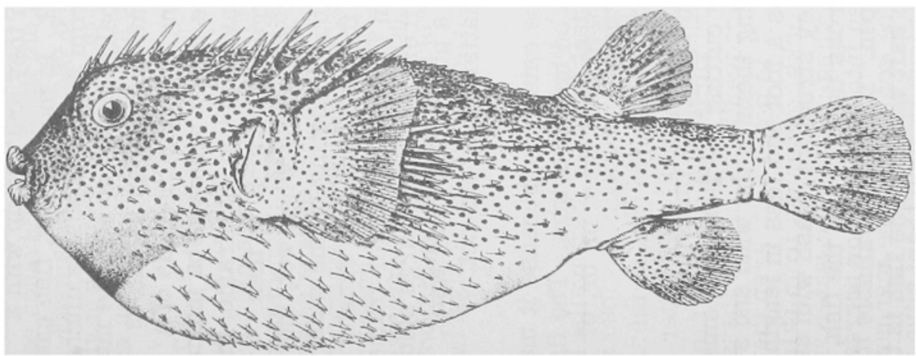
FISHES

Fishes are, of course, one of the most abundant types of food available on the reefs, in the lagoons, and in the sea. At night some species come close in-shore and swim along the surface. By remaining still, a person can hit them with sticks or spear them with a sharpened pole as they surface. The outer margins of reefs usually contain channels, and on the surface of the reef are pools among broken rocks and coral blocks. Fish frequently swim into these places at high tide and leave as the water recedes. It is possible to trap them at such times by blocking the opening with rocks, sticks, or leaves from palm trees. Stones also may be built into low walls extending out into the water and forming an angle with the shore. Fish can be driven into this neck or narrow channel, and into a pool at its inner end, and there be confined in the manner mentioned above. In many cases it may be advantageous to keep them alive until needed, a fresh supply without danger of spoilage thus being provided.

There are a few fish occurring along rocky and coral reefs, and along the muddy or sandy shores of tropical seas, that may be poisonous. Those of this nature most likely to be caught are the parrot fish and the puffers, shown in the following sketches. They apparently develop this condition by feeding on small poisonous animals or plant-like growths along the shores. The condition seldom, if ever, prevails in fish found in the open sea. To be on the safe side, the puffers and parrot fish should not be eaten unless it is certain that they are not contam-



PARROT FISH



PUFFER FISH

inated. If it is known that people native to the area are using these fish, they may be regarded as safe.

Freshwater fish occur practically everywhere. Probably none are poisonous except for the spines in the lower front fins of the catfish, which are similar to the catfish in America. In Indo-Chinese countries, air-breathing forms of this fish are common and are found even in the ricefields, in areas where that grain is grown. As the dry season comes on, these fish bury themselves in the mud and go into a dormant state. They can live out of water indefinitely as long as they are kept slightly moist; often they are dug up with a spade from what appears to be completely caked soil. In most areas, fish can be seined not only from most of the streams but also from small, roadside ditches. Simple seins or dip-nets can easily be woven from palm leaves or even be made from a shirt. In some of the Solomon Islands, the natives have an ingenious method of catching fish. They make a hoop by lashing together the ends of a shoot or small branch, and then place the hoop in the forest where webs indicate the presence of large spiders. The spiders then weave a net in this frame, the web being heavy enough to serve the purpose. A large ant or grub is then placed in the frame, and it is floated on the surface of a pool. When wet, the strands of the web do not show. A fish seeing the "bug" floating on the water makes a strike for it, its teeth become entangled in the web, and it is caught. In parts of New Guinea, a somewhat different system is used. A larger frame is made, and the natives then go into the jungle where there are many large spider webs. By passing the frame back and forth through a number of these webs, enough of the strands become fixed to it to make a satisfactory dip-net.

The flesh of any freshwater fish should not be eaten raw because it may contain intestinal parasites that will have ill effects on human beings. The fish can be broiled over open coals if nothing is available to cook them in, or, of course, can be fried or boiled.

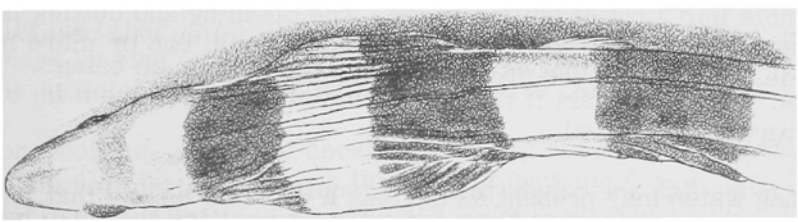
When more fish are caught than are required to satisfy immediate needs, it is possible to preserve them for a time by cutting the flesh into small, thin strips, washing them with salt water, and hanging them in the wind and sunshine to dry. Another method, suitable for varieties a foot and less in length, is to slit open the fish, remove the entrails and boney structure, wash with salt water, and cut diagonal slits about an inch apart across the sides of the fish, preferably from the inside where it has been laid open. If salt is available it is rubbed into the cuts, if not they may be washed with salt water. The fish is then hung in the sun or placed on the surface of a rock with the cut portions exposed. If dried on rocks they should be watched and guarded against ants and other vermin. Under ordinary conditions these methods should preserve the catch for several days.

On the open sea, it is often possible to attract fair-sized fish to a small boat or raft by means of a light at night. They can then be picked up in a dip-net, speared, or sometimes be struck with an oar or boat hook. Of course, the most satisfactory way to catch them would be by means of a hook and line, and these items might well be included in the material placed in kit boxes in boats or on

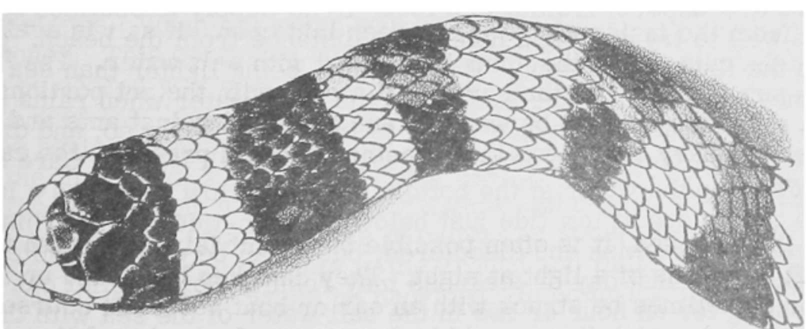
rafts, or a person could make a practice of carrying a short piece of line and a hook in one of his pockets. Frequently a pearl button (or some other kind of light-colored button) placed on the hook is all that is needed in the form of bait. Failure to catch larger fish need not be too discouraging, however, because small edible fishes and crabs can usually be found in masses of floating seaweed. If the seaweed is lifted carefully from the water and shaken over the bottom of the boat or raft, the fish and crabs will fall out. The uncooked flesh of any fish when fresh and caught in the open sea, out of sight of land, is edible. Their blood is drinkable, and the juices in the flesh are much less salty than sea water. This helps considerably when the supply of drinking water is limited or has been used up. Even shark flesh may be eaten. Although they are likely to be somewhat salty and have a tendency to increase thirst, the thick fleshy weeds floating in the open sea can be chewed, furnishing some moisture and nourishment.

EELS

Eels of various kinds are edible. However, snake eels, moray eels, and some other types resemble sea snakes that are found in certain tropical waters. The sea snakes are very poisonous and should be left alone. They are easily distinguished from eels because they have boney plates (scales) - see accompanying sketch No. 1 - covering their heads and bodies, while the eels (No. 2) do not. This characteristic is shown in the sketches, which compare the two forms. In swimming, the eels glide easily through the water, while the sea snakes tend to wriggle as snakes do when moving on land.



NO. 2. EEL



NO. 1. SEA SNAKE

TURTLES

Sea turtles breed on sandy shores and little islands. By following the obvious trail that they make across the land, their eggs may be found. They are reputed to be delicious when cooked for half a minute in boiling water. They will not hardboil like fowls' eggs, regardless of how long they are cooked. If it is not possible to boil them, they can be placed in the sun until thoroughly warmed and then be eaten. In eating them, one bites a hole at one end of the "elastic" shell and squeezes the contents into the mouth. The turtles themselves are a source of good food, but some equipment is needed to prepare them. If it is a small specimen, it can be handled by one man. They can be caught with a fish hook or by tossing a noose around the neck. When this has been done, the creature should be held in place by putting a foot on its back; the neck is drawn tight over a piece of wood or a rock and severed with a knife or ax. The head retains life for some time and can still bite viciously after it has been removed, so it should not be handled carelessly. The body is then turned on its back, and the thin shell and heavy skin which connect the bottom and top parts of the shell are cut through. During this operation one must guard against being clawed by the moving feet and legs. Remove the entrails. If it is a female with developing eggs, toss them into the pot. After the viscera have been removed, cut off all of the meat left on the body and legs, or simply remove the legs and toss them into the pot, as cooking will loosen the flesh. Then cut through the unfused portion of the ribs at either side of the center of the upper or back shell (the carapace), remove the central spine, and obtain the good meat concealed behind it. This whole process is greatly simplified if the turtle or tortoise is one of the smaller forms and can be dropped whole into a pot of boiling water. The cleaning and cutting is much easier after cooking. In the case of the large specimens, two or more men would be needed to do the work but the procedure would be the same.

DRINKING WATER

Drinking water may present as serious a problem as any that may rise when one is separated from the usual source of supplies. Low sand islands in the Pacific area often rise from the beach to an elevation of 35 to 40 feet, and from this high point slope inland toward a central basin which may or may not include a lagoon of salt water. By digging near the foot of the inner slope, water often may be found at a depth of from 3 to 5 feet. If no supply is obtained from such places, it is well to try digging a hole some distance from the beach. Do not go deeper than the first water found. Fresh water, being lighter than sea water, has a tendency to remain on the surface of the salty water when rains soak down through the soil. Thus the surface water is fresh, or nearly so, and drinkable. The well should not be dug too deep or it will strike salt water. Care should be taken not to stir up the water at the bottom of the shallow well. As a last resort, a hole can be dug at low tide just below the high-tide mark. This will yield water that may be brackish and discolored, but it can be used. Limited quantities should be taken the first day or sickness may result. Some relief can be obtained by resting for an hour or two in the salt water of the sea with the body covered to the neck. When this is done a certain amount of moisture is absorbed through the skin.

On islands covered with jungle, there often are many air plants in the trees. The bases of the leaves of these air plants hold water for a long time. It is necessary to strain out bugs, wrigglers, and an occasional frog, but the water is good. Where there are coconut palms, there is always a source of drinking water in the nuts. Green nuts are best but the fluid is good in any of them. Trim off the husk on the free end to a point, chop off the point so as to cut the top of the shell inside, and there is a cup containing coconut water ready to drink. A heavy bush-knife or machete is really essential for this operation. In the last extremity, blood of sea birds will furnish a certain amount of fluid.

The strongly flowing streams and springs of the upper parts of the mountains on the larger islands and portions of the mainland are quite safe to drink unless, of course, a hill village is somewhere upstream in the vicinity. In the lowlands, which may be densely populated, the water in all streams is likely to be polluted. Standing water anywhere is dangerous. Where there are settlements or small villages, one can drink from a well in an emergency. If possible use the water from a well located some distance from the center of the village. The safest procedure, where it is at all practicable, would be to boil the water or to treat it with some of the chemicals provided for that purpose.

CONTAINERS FOR COOKING FOOD

Mention of the need to cook the shrimps, crabs, and other sea food raises the question of what can be used for a container. Where bamboo is available a section cut from a bamboo stem, the cuts being made below two of the nodes occurring at intervals along the stem so that one end of the section is left closed while the other is open, furnishes a suitable vessel for improvised cooking. The bark or rind on the green bamboo is so durable that water can be heated in it sufficiently for cooking before the fire chars and burns it through.

Stone-boiling, a form of cooking formerly common among the American Indians, might also be used. When this method was employed, hard flat stones, approximately the diameter of an ordinary saucer, or round ones a little larger than a baseball were heated in a fire until very hot and then were dropped into a container holding water. Vessels used for this purpose were water-tight baskets, containers made from bark, and skin bags or pouches. In most cases the system followed was that of partially filling the vessel with water and dropping in a few hot stones. When the water was hot, more was added together with other hot stones. This continued until the desired amount of water was ready. The food to be cooked was then dropped in and other heated rocks were added as needed to keep the "pot" boiling. Sticks or rudely fashioned tongs were used to handle the heated stones. Frequently a small branch, bent in the middle to function in the manner of a nutcracker, was used for the purpose. Whether or not this method of cooking would be applicable would depend on the availability of hard, compact stones and of a piece of canvas or some other fabric that would hold water. By digging a hole in the ground and lining it with some such material, a usable container would be provided. In compact, clayey soils the

earth itself would hold water sufficiently long for such purposes, although anything cooked in it would tend to taste "muddy". In emergencies, however, even that might not be wholly unpalatable.

Note: The foregoing article was prepared at the Smithsonian Institution from memoranda submitted by members of its staff.

[redacted]

TACTICAL AND TECHNICAL TRENDS

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January 14, 1943

Prepared for
ARMY GROUND AND AIR FORCES AND SERVICES OF SUPPLY
by
MILITARY INTELLIGENCE SERVICE, WAR DEPARTMENT

[redacted]

CONTENTS

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- Military Reports on the United Nations, published monthly.
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SECTION I

1. EVASIVE TACTICS OF GERMAN LEVEL BOMBERS

Evasive action, as employed by German Air Force level bombers, may be divided into two categories. One includes all maneuvers made as a matter of normal routine; the other applies to action taken when the presence of enemy aircraft is detected.

The first type of action consists of flying a weaving course in azimuth and simultaneously changing altitude by as much as 500 feet above and below the mean. Occasionally, an orbit or complete circle is made as a further safeguard and may be repeated as often as the pilot considers necessary. This circle is often effective in preventing the successful completion of a ground-controlled interception, and has the added advantage of being easy to carry out while making good a track to the target.

The second type of evasive action is of a much more violent nature. On the approach of intercepting aircraft, it is not unusual for a bomber pilot to quarter-roll his plane, applying full bottom rudder. The resulting dive is very steep, especially if the stick is pulled back hard immediately before the quarter roll. The bombers frequently pull out of this maneuver as low as 2,000 feet.

However, it appears to be beyond the capabilities of the majority of German pilots to carry out evasive tactics irregularly and still make good a mean track to the target. The result is that evasive tactics are used in a comparatively regular manner which the ground control stations are able to follow and sometimes even to predict.

Different tactics are employed in avoiding or escaping searchlights, but the most common evasive action consists of gliding through a known searchlight belt at high altitudes with throttles closed, so that the sound locators for the searchlight and antiaircraft batteries are unable to detect the aircraft.

Enemy aircraft, when picked up by searchlights in night combat, have attempted to deceive the ground defenses by turning away from the beam and immediately returning from another quarter with navigation lights on.

The bombers take effective evasive action on their approach to, and getaway from, a target by desynchronizing the engines and constantly altering the throttle settings. This action upsets the normal action of the detectors and makes difficult an accurate prediction of the plane's course.

2. JAPANESE RUSE - A DECOY SHIP

The use of dummy positions, installations, etc. presents nothing new in principle. When properly used, however, they can offer considerable protection against bombing attacks if not disclosed by close study of air photos and careful direct observation.

An effective example of the principle here involved has, at least in one instance, been used by the Japanese. A Japanese supply ship, in the harbor of an island captured by them, was beached (or anchored very close to the beach). She was repeatedly attacked by United States planes and remained in the same position for an extended period of time, apparently so badly damaged as to be unable to put out to sea. In a subsequent attack on this harbor, our planes observed two ships, one in the old position near the beach, and what appeared to be a newly arrived ship farther out in the harbor. The planes bombed and hit the ship out in the harbor. The wrong ship was attacked.

When the planes returned to their base, air photos taken during the mission were studied. They showed that the old damaged ship was the one out in the harbor; its former position near the beach had been occupied by the newly arrived ship. Except for the bridges, both ships were practically identical in general appearance and size. Barges were located alongside the damaged vessel in its new position, but careful scrutiny showed its hatches to be covered. The new ship had no barges alongside, yet it was noted that its open hatches disclosed a partially unloaded cargo.

It is obvious that the intention was to protect the newly arrived ship by making it appear to be the old damaged vessel. The ruse was at least partially successful in that the enemy gained valuable time in which to unload the new ship.

3. SALVAGE OF CAPTURED AIRCRAFT BY THE GERMAN AIR FORCE

War is the best testing ground for all types of fighting materiel, and this is particularly true of aircraft and their equipment. The Italian conquest of Ethiopia, the Spanish Civil War, and the Sino-Japanese conflict have all provided excellent laboratories for experiment in the design and performance of combat planes.

In the present war, air power has played, and will continue to play, such an important role, that all belligerents are constantly engaged in improving their planes. Construction, speed, maneuverability, range, ceiling, armor, and fire power of aircraft are subject to daily study and change. Since World War I, the character and scope of air warfare has been revolutionized, necessitating vast improvements in design and construction. Nations have approached this problem from different angles with varying results. During peacetime, efforts were made--particularly by the Axis countries--to guard their most important air secrets from potentially hostile powers, although certain revelations could not be avoided when the aircraft were tested in actual battle experience such as the Spanish Civil War.

With the outbreak of World War II, it became vitally important for each belligerent to acquire as complete information as possible with respect to its opponents' planes in order to have the technical knowledge with which to combat them. The Germans were very late in recognizing the importance of information

to be obtained from captured planes and equipment. Their plans for a lightning war did not envisage the necessity for keeping up with their opponent's technical developments. The Battle of Britain was the beginning of the lesson that showed them their error, but it was not until 6 months or so later that a formalized procedure for the salvage and examination of crashed and captured enemy aircraft began to be put into effect.

Every officer of the German Air Force who sees an enemy airplane shot down, force land, or crash in his vicinity, is required to report the incident immediately by telephone to the Air Liaison Officer at Division Headquarters, who in turn forwards the information through channels to the Luftgaukommando (German air corps district headquarters). The observing officer can telephone direct to the Luftgaukommando if such communication is available. A German Air Force officer will convey the necessary information by Air Despatch Letter Service. The report must include identity of reporting unit and of the guard furnished, the location, nationality, and condition of the aircraft, and the location of the crew.

The task of salvage is delegated by the Luftgaukommando usually to the commanding officer of the airdrome area nearest to the location of the plane; he dispatches a first salvage detachment by car. This detachment consists of an officer, a technician, a photographer, and one member of each of the communications and ordnance staffs.

At the scene of the crash, photographs are taken immediately, and the negatives sent to the Luftgaukommando photo section for examination. A preliminary technical report is then prepared for transmission to, and evaluation by, Luftgaukommando Intelligence. This report should contain a description of the plane, including data as to its position, special characteristics, construction, armament and equipment, performance, and purpose. All tactical material and personal documents of the crew should accompany the report.

The member of the technical staff with the detachment will then request a salvage squad from the airdrome to complete the salvage, and this squad will include an engine specialist and additional special personnel. Salvage operations by Army or Air Force Troops are never permitted. Their duty is merely to guard the plane until the arrival of the salvage squad in order to prevent removal of any parts for souvenirs or other purposes.

The flying equipment is salvaged into two groups, signal and flight data being segregated from technical material. All salvaged material is conveyed to the main Air Force station in the area, and from there to the Air Force branch concerned, except that radio equipment is dispatched via the Luftgaukommando to the Chief Signal Officer, Air Ministry.

Reports by the airdrome authorities responsible for the salvage operation must immediately be made by telephone or radio to the Air Ministry and Air Staff Intelligence of the Air Force High Command in case of the signal equipment,

and to the Chief Equipment Officer on the technical material. Other detailed written reports on the salvage operation, and on the plane and its equipment, are made respectively to the Luftgaukommando and the Chief Signal Officer.

If there is any danger of the aircraft catching fire or being "shot up" by the enemy, all possible efforts must be made immediately to salvage equipment--particularly photographic equipment, maps, and documents,--and to transmit the same to the responsible officer, together with a description of the plane from which they were taken, and the precise time and place of crash.

The crew will be made prisoners of war, segregated, interrogated, and disposed of in the usual manner. Any documents in their possession are sent to Luftgaukommando Intelligence immediately.

ANTIAIRCRAFT

4. GERMAN SIX-GUN HEAVY ANTIAIRCRAFT BATTERIES

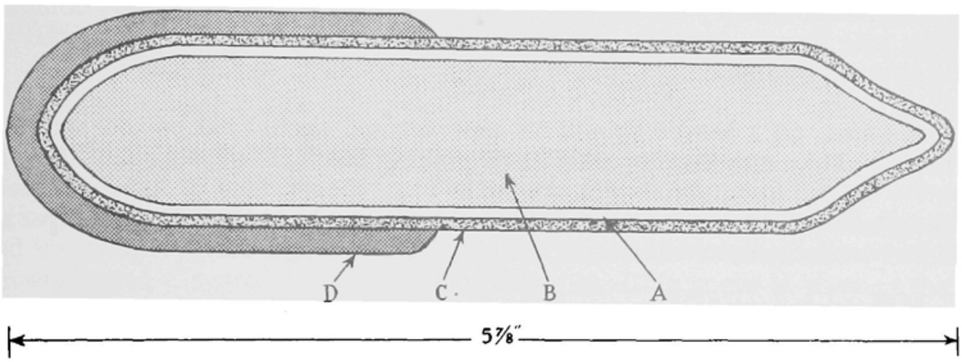
There is evidence indicating that at least some German heavy antiaircraft batteries have been organized on a six-gun basis instead of the usual four guns. There are indications that in North Africa this change had been effected to a large extent some time ago. In one instance the equipment of a heavy antiaircraft battery in North Africa is reported to have included six 88-mm guns and two 20-mm guns. There were also 62 vehicles, among which were 9 motorcycles, 20 medium trucks, 8 tractors, and 11 trailers.

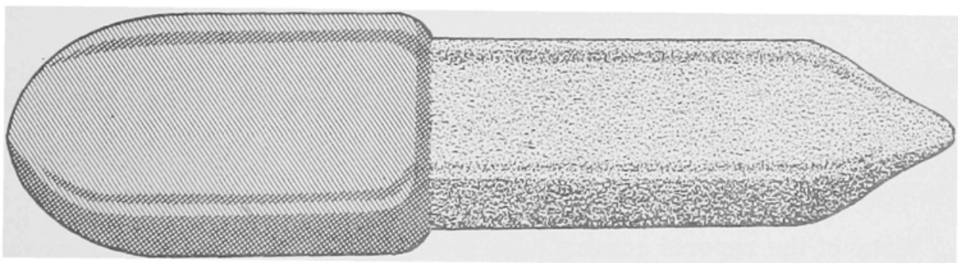
CHEMICAL WARFARE

5. INCENDIARY CAPSULES

An incendiary capsule was found in a ship which was set on fire on April 23, 1942. The accompanying sketch is a full-scale drawing of the object.

SECTION





EXTERIOR VIEW

A is a flexible, gelatine capsule, yellow and translucent, containing a highly volatile fluid B. The outer surface C is covered with a sticky, black, carbon or graphite compound. D is a hard, brown casing, covering one-half of the capsule. This appears to be a magnesium compound and burns fiercely when ignited.

The capsule is ignited by heat, a test showing that it became active when placed in the sun, even when covered by a sheet of corrugated iron. It would seem, therefore, that no very high temperature is required to cause the device to function.

There is obvious danger that these capsules may be slipped into aircraft, motor vehicles, supplies, buildings, or any vital place where the sun's rays or artificial heat may ignite them.

6. INCENDIARY LEAVES

It has been reported that incendiary disks, 9 inches in diameter and having the appearance of yellow crepe rubber, have been found on the east coast of England. They appear to have been dropped by enemy aircraft, and are probably intended to set fire to crops and woods.

These incendiary leaves are thought to contain a phosphorous compound, and burst into flame when dry. There is no risk of explosion if only small quantities are present.

If found, such leaves should be kept wet and should not be touched with bare hands. They may be disposed of by placing them, in small quantities, in a fire in the open. When the leaves are picked up, the residue of inflammable material on the ground may cause a fire after it has become dry. Such residue should be carefully watched until it is completely burned out.

It is dangerous to dispose of the leaves by throwing them into inland waters or the sea, since there is always the possibility that they may be washed up on to vulnerable objectives.

ENGINEERS

7. JAPANESE CAMOUFLAGE

Many of the reports coming back from the various theaters of operation have stressed the excellence of Japanese camouflage (see Tactical and Technical Trends, No. 14, p. 16). It appears that they adapt the type of camouflage employed to suit the country in which they are operating, rather than relying upon any set principles or stereotyped pattern. As it is evident that much importance is attached to this subject, a selection of topics in these reports is given below.

* * *

a. A British officer's report states that the Japanese are excellent at camouflage, and use the chameleon principle. Whatever type of country was being traversed, their style was altered, in that different colored vines or branches, to correspond with local vegetation, were fastened to their persons. Thus, lying along branches or standing against bushes, they were absorbed into the landscape.

b. A dead sniper who was examined carried the following camouflage equipment: a green net for his helmet; a pair of long green gloves; a bottle of green liquid with which his face and rifle were smeared; and a small hypodermic syringe. This syringe was empty when examined, and there was no indication of its contents.

c. According to another report, Japanese snipers have packs in which a number of differently colored gymshirts are carried. They change these shirts

according to the color of the cover from which they are operating. They also have face nets, which are of various colors, and like the gymshirts, are changed according to the nature of the cover.

The report also states that camouflaged elephants had been seen. Their hides had been painted with large patches of different shades of green to tone in with their surroundings.

8. ITALIAN MINEFIELDS IN NORTH AFRICA

In order for obstacles to be effective, they must be covered by small-arms fire, and if extensive, also by artillery fire. In North Africa the Italian Trieste Division employed a system of observation and signalling posts to prevent the British from clearing gaps in the minefields. These posts, armed with light machine guns, are manned from dusk to dawn, with at least two men on duty at all times. They are located both inside the minefield and along the far edge.

Prisoners of war stated that, "mines were always laid about 1 yard apart, except when the supply was inadequate in which case they were laid either haphazardly or from 2 to 4 yards apart." It is thought that reference is here made to a density of one mine per yard of front, since if the mines were spaced as close as one yard apart the explosion of a single mine would probably touch off the entire minefield by sympathetic detonation.

Much difficulty appears to have been experienced by the enemy in the marking of minefields. Various methods have been reported. One method, which is believed not to have been heretofore reported, is to use a system of wooden stakes: high stakes to mark the near edge, short stakes to mark the far edge and flanks.

9. THREE NEW GERMAN IGNITERS

Three new German igniters have been reported. While there is no evidence that these igniters have been adopted by the German Army, they may be in the near future. It appears that the following descriptions may not be accurate in every detail; however, they are sufficiently accurate to permit recognition of the igniters should they make their appearance.

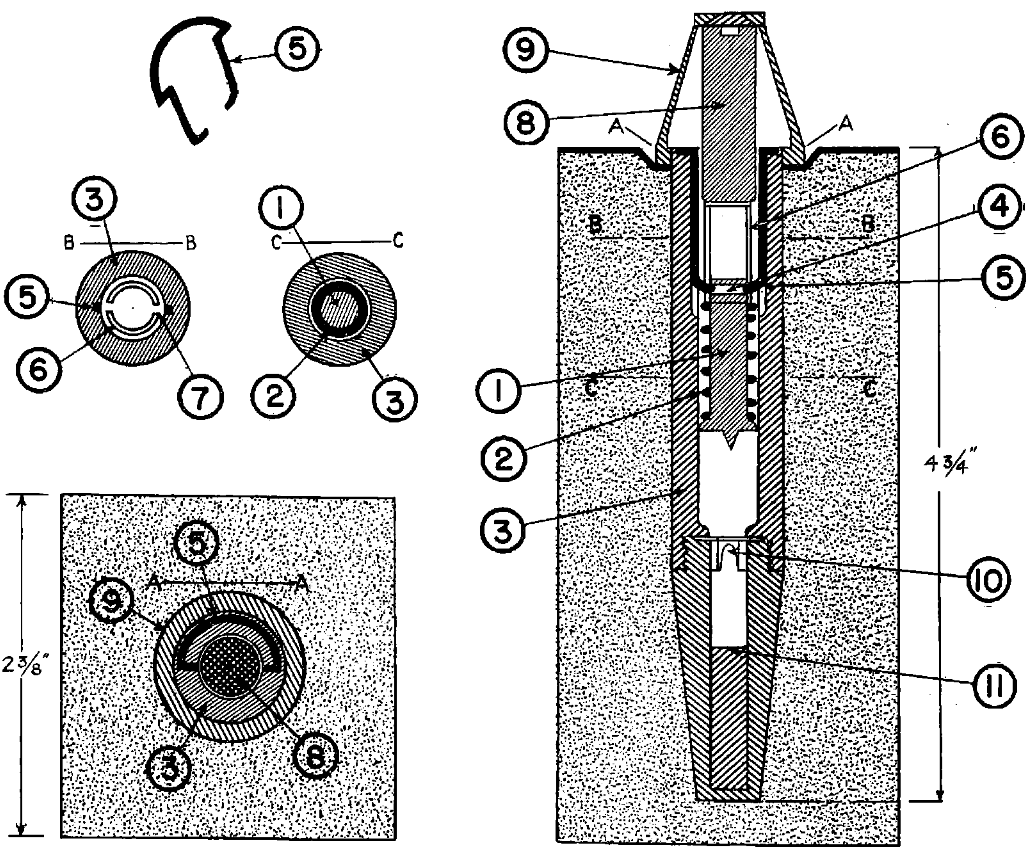
a. Reinhard Igniter

This igniter is illustrated in sketch No. 1. It consists of a striker (1)

with a spring (2) contained in a casing (3). The top end of the striker is provided with a cavity (4), probably a cylindrical hole passing through the striker. This cavity is gripped by the turned-in ends of two arms of a piece of spring steel (5), and the striker (1) is thereby held in place in the assembly. Above the striker is a sleeve (6), which is provided with two diametrically opposite longitudinal slots (7), in which slide the turned-in ends of the arms (5). Above the sleeve (6) is the main pressure bolt (8), which is kept in position by a retaining cap (9), the exact construction of which is not definitely known. Below the striker is the percussion cap (10) and a detonator (11).

When pressure is applied and the bolt (8) depressed, the sleeve (6) is forced down and compresses the spring (2). The striker is then spring-loaded but still held in place by the turned-in ends of the arms (5) in the striker cavity (4). When the lower end of the bolt (8) comes into contact with the turned-in ends of the arms (5), it forces them slightly apart and frees the striker (1), which, forced down by the spring, fires the cap (10) and the detonator (11).

SKETCH NO. I

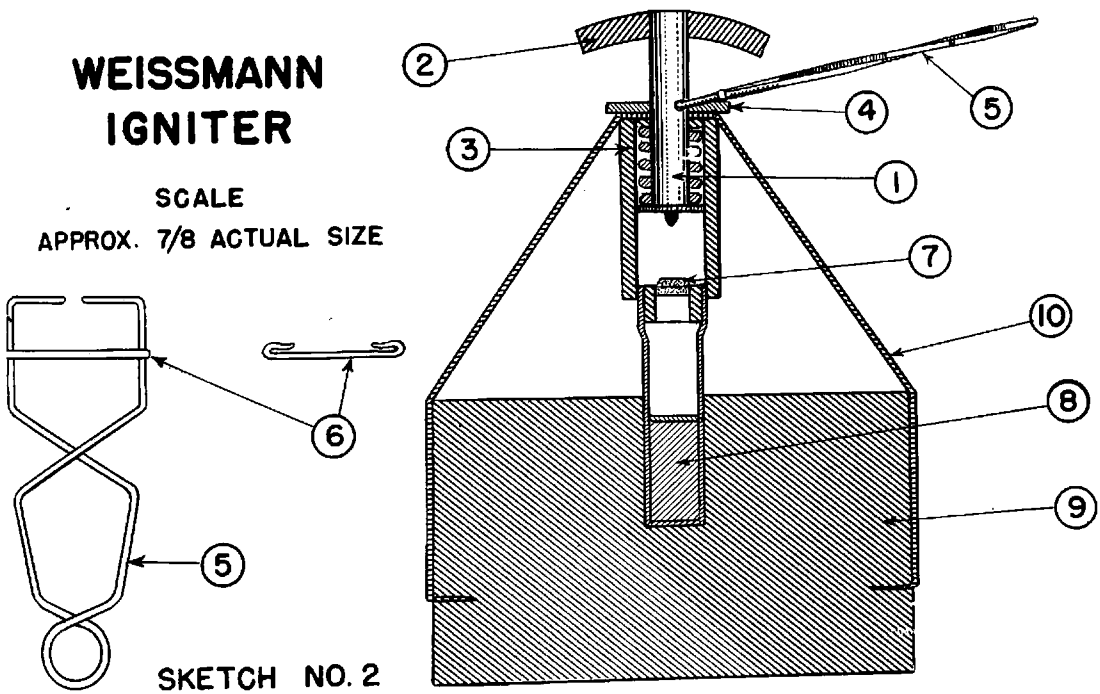


REINHARD IGNITER

b. Weissmann Igniter

This igniter is illustrated in sketch No. 2. It is designed to be used either as a push-igniter for improvised mines, etc., or as an impact igniter for HE charge when used in the assault. It consists of a spring-loaded striker bolt (1), at the top of which is a curved pressure head (2). The bolt is held against this spring (3) by a small glass rod (4), diameter 1.2 mm (0.05 in), which passes through a hole in the bolt, and by a safety device (5), consisting of a small pair of tongs, the turned-in ends of which fit into another hole in the bolt and are kept in position by a small spring clip (6). In the base of the igniter is a percussion cap (7) and a short detonator (8). The igniter and detonator assembly are secured to the HE charge (9) by a thin metal cramp (10).

In operation, it is assumed that the safety tongs (5) are removed by withdrawing the clip (6). Pressure or a blow on the head (2) will then shatter the glass rod (4) and allow the spring to drive the bolt on to the cap (7).



WEISSMANN IGNITER

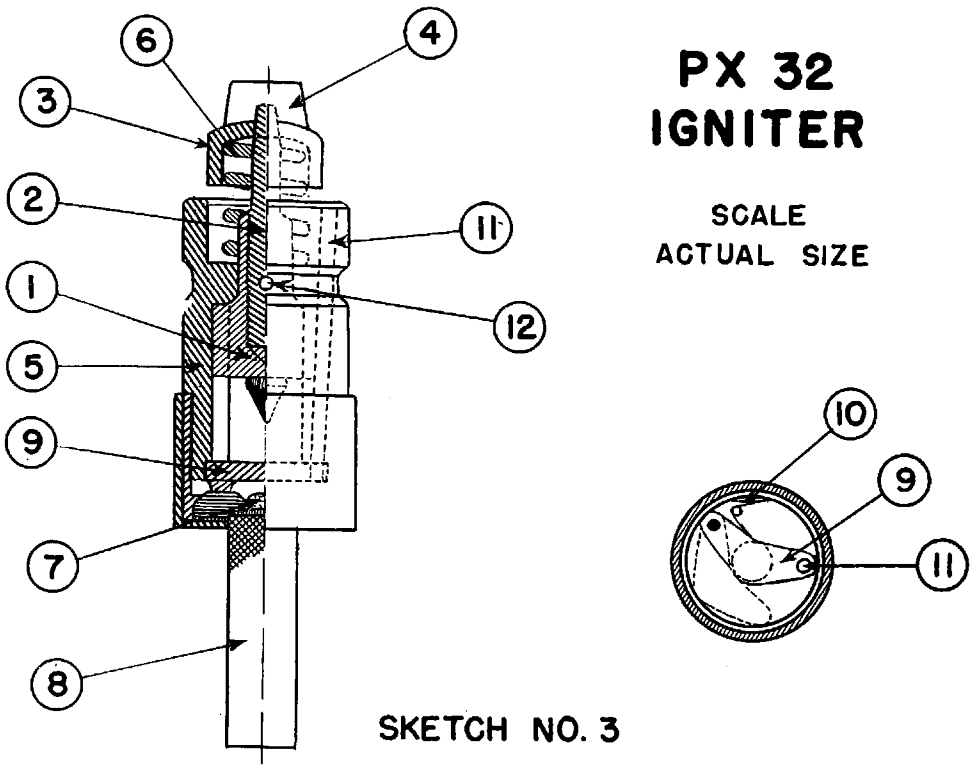
SCALE
APPROX. 7/8 ACTUAL SIZE

SKETCH NO. 2

c. PX32 Igniter

This igniter is illustrated in sketch No. 3. Like the Weissmann Igniter, it can be used either as a push-igniter in improvised mines or as an impact igniter. It consists of a striker bolt (1), which is apparently made in two portions, the inner component (2) supporting at its top end the hollow pressure cap (3), on the top of which is a small metal vane (4). The bolt is contained in a stout casing (5), and is normally kept in the positions shown in the sketch by the spring (6). In the base of the igniter is a percussion cap (7) and a detonator (8). Above the percussion cap is a safety device consisting of a small wing-shaped plate (9), pivoted at one end. When in the safety position, this plate is kept in the position shown in the sketch, against the action of a small spring (10), by a vertical safety pin (11) which is inserted from the top of the igniter and passes through a small hole in the free end of the plate (9). When in the position shown, the plate (9) forms a guard between the bolt (1) and the cap (7). On withdrawal of the safety pin (11) the plate (9) is forced over to the position shown dotted, and the bolt (1) has access to the cap (7). A further safety device is provided by a pin which passes through the horizontal hole (12).

It is assumed that both pins (11) and (12) are withdrawn before use. Pressure or a blow on the cap (3) will then force the striker bolt on to cap (7).



SKETCH NO. 3

10. LESSONS FROM GERMAN INFANTRY OPERATIONS

The following report is an extract from the translation of a German Army High Command memorandum issued on December 18, 1940.

* * *

a. Reconnaissance

(1) The principal reason for failure of a reconnaissance is the desire of commanders to push forward the attack. As long as the situation on both sides remains fluid, this is justified. In such cases, the best opportunity to attack will be lost if the results of reconnaissance are too long awaited. When an attack is launched against an enemy who is organized for defense, the time taken to prepare the attack is also advantageous to the defender. Commanders must therefore do their utmost to secure speed. However, the preparation of an attack demands time, which must be allowed if unnecessary losses and set-backs are to be avoided. This time must be thoroughly used for reconnaissance.

(2) The employment of over-weak patrols is partly due to previous teaching. For example, in our Infantry Training Manual, it is stated that "a few resolute men" suffice, and then again that "the minimum strength is generally a commander and two men". Almost all patrols in peacetime exercises were of this strength.

It is also the result of the attempt of company and platoon commanders to keep their troops together, and avoid weakening them prematurely. Experience shows that only combat patrols can carry out reconnaissance against an enemy organized for defense. Patrols formed of from one to two squads under the leadership of a platoon commander and supported by mortars and machine guns have proved successful. The squad is also the most self-contained unit for this purpose and, with four squads to a platoon, one that is always available.

b. Assault Detachments

(1) Formations in Approach and Attack

To secure superiority for the fire power of a rifle company, a large number of machine guns must be employed in the front line. In many cases troops were formed according to their departure from the assembly position, and retained this formation throughout the approach although the time to adopt battle formations had not yet arrived.

(2) Arrowhead Formations

The usual method of attack against a permanent position is to force a breakthrough in arrowhead formation with a strong spearhead. The objective of the arrowhead is the enemy's weak point, "wherever the tactical situation and ground offer the best chance of pushing home the attack swiftly." The strength and composition of the formation of the advancing company depend on cover for the approach, fire support, and the breadth of the objective.

All available heavy weapons, including those of reserve troops, should be brought up to lay down a concentration of fire in conjunction with the advance of the assaulting force.

Reserves are also brought up to the point of penetration. They approach the battle with assault and fire, keep the situation fluid, and extend the breach on either side.

It can thus be seen that the arrowhead formation is a development of the theory of concentration. The most important factor is not the formation of the company or battalion, but the coordination of all forces, assault, fire power, and reserves, against the chosen objective.

It is the duty of the tactical commander to decide how the sectors of the enemy position not directly assaulted are dealt with. If a battalion advances against its objective in arrowhead formation, with one rifle company forward, the stronger sectors of the enemy positions on the flanks are not at once engaged. The enemy can therefore often bring down unhindered enfilading fire upon the head of the attack. The fire of heavy weapons and of artillery will not usually suffice to neutralize these sectors. They can only be efficiently neutralized by direct attack. Hence the arrowhead must be extended to the flanks by the employment of patrols of fighting strength to attack the flanking position. The company forming the arrowhead, and the battalion, must be organized with this in mind.

(3) Concentration of Fire for Advance

Many reports emphasize the advantage of concentrated fire. There is nothing new in this. Battalion commanders should coordinate fire according to the tactical conditions. Stereotyped fire plans should be avoided.

Concentration of fire requires careful preparation. If all firing is forbidden during the preparation, the initiative, and therefore the spirit, of the junior officers is lowered. Even during the preparation, every company, and even every platoon, should exploit any opportunity of pressing forward, and even provide the needed impulse by concentration of fire.

Strong emphasis should be laid on the importance of careful timing of fire and movement. The combined fire of heavy weapons and artillery must coincide with the advance of infantry. It is the task of the battalion commander and all commanders of heavy weapons to push the advance steadily forward by means of concentration of fire. It is the task of all commanders and junior officers of rifle companies to bring up their men and push on as long as fire continues. The key to success lies in advancing under cover of friendly fire.

Both the concentration of fire and the advance under its cover must be practiced as a drill.

(4) Concentration of Fire--Heavy Weapons of Reserve Units

Fire is concentrated on the point of penetration. All heavy weapons must prepare to combine fire on targets which obstruct the line of advance, and after that on the objective. The battalion commander orders the exact time at which the fire is to be concentrated, in accordance with the considerations discussed above. The regimental commander increases the concentration, where possible, by employing the heavy weapons of the reserve battalions as well as by appropriate cooperation with the artillery.

c. Fighting in Woods

An attack through thickly wooded country imposes special battle tasks on commanders and troops. It demands careful preparation and timing.

Quick successes can be won by good observation, cunning, and surprise attacks. When the enemy is encountered suddenly, he must be attacked with the bayonet immediately.

In large, thick woods, with heavy undergrowth, reconnaissance patrols of fighting strength must be sent out to force the enemy to open fire and disclose the whereabouts of his well-camouflaged positions.

The spearhead of the attack, which follows the reconnaissance element, must be liberally equipped with close-combat weapons, automatic pistols, and if there is thick undergrowth, with axes. Single heavy weapons, and antitank and infantry guns are brought up close behind the leading elements to clean out weak centers of resistance from clearings and paths. Strong centers of resistance should be passed by, and left to the following units. If this is impossible, they must be carefully reconnoitered and assaulted with the support of heavy weapons.

Loud cheering and the sounding of the "Charge!" when assaulting troops break through confuse the enemy and facilitate cooperation between friendly troops.

The foremost attacking parties penetrate the enemy position in arrowhead formations. They are followed, at distances determined by the ground and the tactical situation, by rifle companies which comb the woods and clean up the ground captured.

Protection must be secured for the flanks.

Snipers in trees can be dealt with effectively by raking the tree-tops with machine-gun fire.

* * *

/s/ von Brauchitsch

11. GERMAN ATTACKS ON PERMANENT DEFENSES

The following German method of attack on permanent fortifications was observed in Russia; the steps were—

(a) Heavy dive-bomber attack on the Soviet artillery;
(b) Selection of two or three front-line pillboxes which were subjected to terrific box barrage;
(c) Under cover of barrage, a small party of storm troops crawls up, and either attacks the embrasures with flame throwers, or attacks with small, accurate, antitank guns, which put shell after shell into the same hole;
(d) When the selected pillbox has been captured, infantry advances, and occupies the position.

It is interesting to compare the above with the method employed against the Maginot Line:

(a) Casemates were subjected to 2 hours' heavy artillery fire followed by dive-bombing attacks for 20 minutes;
(b) Special engineer assault detachments, under cover of antitank, machine, and infantry guns, advanced and threw explosive charges into the embrasures;
(c) Smoke grenades were used to protect the assault troops from enfilade fire;
(d) Infantry advanced as soon as the casemates were captured.

The above methods are in keeping with the normal German practice of concentrating the maximum effort at one point with the object of effecting a breakthrough.

12. STEREOTYPED ATTACK TACTICS IN THE MIDDLE EAST

A study of the tactics employed by the Germans in the Middle East, when approaching a prepared position, shows that they have developed a stereotyped form for these attacks.

Initial contact is made by armored cars operating on a wide front. These cars operate in groups of two or three, and, if seriously opposed, turn back. The cars are followed by mixed columns of tanks and motorized infantry, the former usually leading. After the armored cars have made contact, an aggressive reconnaissance is carried out by tanks, which, if successful, are followed by the motorized infantry. A full-scale attack is then developed. If the tanks are driven off, a pause follows while a more detailed reconnaissance is carried out. On the results of this reconnaissance the plan is drawn up.

A German attack is generally launched against that part of the defense system which is nearest the principal objective. Only that part of the front which is to be attacked is subjected to careful reconnaissance, the remainder being either ignored or only superficially reconnoitered. A careful watch on the con-

duct of this reconnaissance will, therefore, give a very accurate idea where the attack will strike. The plan of attack is worked out in great detail, full consideration being given to such factors as concealment and surprise. Surprise is obtained not by attempting to hide the imminence of the attack, but by concealing from the defender its extent and scope. For example, the forward movement to the assembly area is frequently carried out with the evening sun in the eyes of the defender, and the actual attack launched at dawn or by the light of the moon.

The attack is preceded by heavy air bombardment of known gun positions. Tanks then move forward in the fading light, covered by mortar fire and supported by dive-bombing attacks on the forward positions, and establish themselves in front of the obstacle covering the forward areas. Engineer units pass through the tanks under cover of darkness, and remove the obstacles either by lifting the mines, or by forming gaps in the ditch. At the same time a machine-gun battalion is brought up and established in line with the leading tanks. At daylight, or in moonlight, the German infantry attacks the forward areas, with tanks moving in support. When visibility permits, the tanks either advance in mass formation with the object of breaking through the gun positions and other vital points of the defense, or they assist the infantry in systematically mopping up defended points. In the latter role, the methods employed include flame-throwers, direct thrusts at machine-gun nests and throwing bombs into trenches.

Whenever such an attack has failed, especially when the tanks have passed through the forward areas to attack gun positions, it has always proved extremely costly to the Germans.

From the above, the following conclusions may be drawn:

(a) The points most liable to attack are those nearest a vital objective which have good tank country in front of them;

(b) Forward areas of resistance should be sited to cover any defiladed ground which could be used by the enemy as an assembly area;

(c) Forward areas should be sufficiently protected by obstacles to prevent their being over-run by tanks, or by infantry at night. Adequate protection against dive-bombing in the form of slit trenches should be prepared, and anti-aircraft fire should be coordinated. Areas of resistance should be self-supporting for a sufficient time to ensure the defeat of the tank attack and the subsequent restoration of the situation by counterattack.

(d) Gun positions should, where possible, be protected by a tank obstacle at such a distance in front that they cannot come under pointblank machine-gun fire from the enemy tanks.

(e) The principal object of the defender should be to separate the enemy tanks from the supporting infantry.

13. OCCUPATION OF A POSITION AT NIGHT

The importance of preliminary reconnaissance in the occupation of a position at night is clearly shown in the following account of the destruction of a German infantry battalion in Libya last June.

The battalion (with only two companies, the 9th and 10th) arrived at a new position at 0230, and began at once to dig in, leaving a space of about 500 yards between the two companies for the 11th Company, which was to come up later. No reconnaissance of the area was carried out "because of the darkness of the night." When dawn came the battalion commander immediately became aware that the company positions were completely dominated by those of the enemy. The two companies in fact found themselves in very close contact with British positions; the Germans' field of fire was limited to a few yards, and they were completely overlooked from the front, the left flank, and the rear. The space left clear for the 11th Company was found to be occupied by a knoll which prevented visual communication between the two companies.

The British immediately opened up an intensive fire of all weapons, which prevented the withdrawal of the battalion and cut the telephone communications. They followed this up by sending out tanks and armored cars which outflanked and overran the 9th Company. The artillery in support of the 9th Company tried to lay down defensive fire, but was in a low position from which it was unable to bring direct fire to bear, and was neutralized by British counterbattery fire.

The British artillery was then concentrated on the 10th Company. When the dust and smoke thrown up by the artillery fire had subsided, the company found about 20 tanks and armored cars on top of it, their fire completely nullifying the weak counterfire from the position. The commander of an antitank gun, who managed to get off a few rounds, was heard shouting to his company commander that the armor-piercing shells were bouncing off the tanks. Thus the 10th Company was overrun.

British armor then advanced on the battery position, capturing the Adjutant (who was wounded), other officers of the battalion headquarters, some men, and the few artillerymen who had stayed with their guns. Only a few appear to have escaped.

The Germans attributed their destruction to:

(a) Lack of day reconnaissance of the position to be occupied;
(b) Lack of information about the British positions;
(c) Absence of the 11th Company, which prevented the formation of a position in depth or any system of visual signals between the two forward companies;
(d) Extreme fatigue of both officers and men;
(e) Lack of artillery support;
(f) Overwhelming enemy superiority in artillery and armor used in close cooperation.

It was therefore concluded that infantry should not be used in open ground against armor unless strongly supported by artillery, so sited as to be able to use direct fire against enemy armor approaching from any direction; nor should infantry be used without the support of armored vehicles.

14. ANNUAL BASE PAY--JAPANESE ARMY

Grade	Annual Base Pay	Grade	Annual Base Pay
General	$1,914.00	1st Lieutenant	
Lt. General	1,682.00	1st Class	$327.70
Major General	1,450.00	2d Class	295.80
Colonel	1,305.00	2d Lieutenant	246.50
Lt. Colonel	933.80	Warrant Officer	261.00 to 278.40
Major	675.70	Sergeant Major	104.40 to 135.72
Captain		Sergeant	46.98 to 78.30
1st Class	551.00	Corporal	31.32 to 53.94
2d Class	478.50	Superior Private	22.27 to 24.36
3d Class	426.30	1st & 2d Class Privates	19.14

Comment: The U.S. dollar has about 4 times greater purchasing power in Japan than in the United States. Note the great difference between the pay of enlisted personnel from sergeant down and that of commissioned personnel-in particular that the pay of a general is exactly 100 times that of a private.

15. SKI PATROLS OF THE SOVIET ARMY

The following description of the operations of ski detachments is taken from the Soviet Military Manual of Winter Operations.

Although this report concerns ski patrols, it is felt that much of the training and technique involved is applicable to raiding parties generally.

a. General

Ski detachments generally operate in the enemy's rear. Existence of gaps in enemy positions, broken ground, and wooded country favor infiltration of ski detachments to the rear of the enemy.

The following tasks are assigned to these detachments:

(1) Destruction of enemy personnel and materiel;
(2) Destruction of enemy staffs and command posts;
(3) Destruction of enemy communications and transport, and the

burning of depots and bases;

(4) Destruction of planes on airfields, and demolition of road and railway bridges;

(5) The capture and holding of an important objective in the rear of the enemy, for the purpose of impeding his retreat and the bringing up of his reserves.

b. Personnel of Ski Detachments

The composition and strength of a ski detachment will depend on the nature of the task, distance to the objective, length of fighting operations, likelihood of meeting the enemy, availability of air support, and the support of the ground forces. In any case ski formations must possess great mobility, and should be capable of functioning off roads and without contact with friendly forces for several days at a time.

Skiers must be exceptional men. To carry out their tasks successfully, ski troops must possess the following qualities: excellent training, great courage and initiative, excellent physique, powers of endurance, ability to find their way easily in any locality at any time of day or night and in any weather, and ability to use skis expertly.

Each skier must have great determination, must be almost foolhardy, be vigorous and yet careful, quick of movement, sharpsighted, patient, and expert in the art of concealment. He must never, under any conditions, get lost.

All ski personnel should:

(1) Be well versed in demolitions and know how to deal with enemy mines;

(2) Know how to use every means of communication, and be able to communicate with friendly troops;

(3) Be adept at first aid, and able to apply it on the field of battle;

(4) Be experienced in constructing shelters out of any materials at hand.

c. Equipment

A ski detachment must be thoroughly equipped for independent action when out of contact with its own troops for several days at a time. Skiers must be warmly equipped and carry light automatic weapons and knives. Every form of fighting equipment, rations, and supplies, including means of evacuating wounded, must be mounted on skis and sleds. It is the duty of every rifleman on skis to carry his individual rations, arms, and ammunition. Ammunition for automatic weapons and mortars, explosives, and incendiary materials are carried on ski mountings. Operations under conditions of constant frost, and nights spent in the open demand that clothing and footwear should be in perfect condition. This should be a subject of constant attention by all commanders. A sufficient number of spare socks should be provided. The regulation Red Army tent must always accompany all personnel. Ski detachments must be provided with spare skis, harnesses and poles, depending on the length of operations and on

whether the ground is broken or not.

Food must be carried in a form which, while taking up the least space, has high food value and can be quickly prepared. These requirements are best met by canned products and food concentrates. Whenever possible, thermos bottles should be filled with a hot drink and all personnel should be supplied with hot-water bottles.

d. Sick and Wounded

Not a single wounded or sick man must be left to the enemy. For evacuation, the wounded and sick of ski detachments must be transported on special ski mountings and sleds. In exceptional cases one may transport wounded by tying skis together.

e. Communications

Communication between the ski detachments and their headquarters is carried out by the use of planes and sometimes by radio. Radio codes in air-ground communication must be established beforehand, and given to the commander of the ski detachment when he is assigned his mission. The periods for radio communication should be also arranged in advance. The fact that the use of radio discloses one's location to the enemy should be kept in mind and, therefore, the periods for use of radio should be arranged to coincide with an anticipated change of location.

The routes and areas of operations of a ski detachment should be studied by its commander in conjunction with the pilots of aircraft who will be detailed for communication purposes.

f. Tactics

(1) General

A ski detachment should:

(a) Avoid battle until the objective is reached;
(b) Destroy small groups of the enemy which may hinder the attainment of the main objective;
(c) Constantly and stealthily reconnoiter;
(d) Be able to estimate the situation quickly, and avoid battle when conditions are unfavorable;
(e) Always provide for all-around protection, whether at rest or on the move.

The attempt to penetrate to the rear of the enemy should be carried out by night, in fog, or during heavy snowfall, and contact with enemy detachments should be avoided.

Where, in order to reach the objective in his rear, it is impossible to avoid meeting the enemy, the basis of success is sudden, overpowering concentration of fire power and swift attack.

Surprise is best achieved by taking advantage of poor visibility at night and during snowfall.

Ambushes should be widely used by ski detachments.

(2) Combat

A ski detachment engages the enemy:

(a) If surprised on the march by the enemy, and it is impossible to avoid battle;
(b) When it is impossible to attain the main objective without destroying the intervening enemy;
(c) When the enemy, having discovered the ski detachment, is attempting to surround and destroy it.

Success in battle depends on the initiative, determination, and aggressiveness of every commander and every soldier.

Each man and every platoon should be prepared, on receipt of the commander's signal, to break contact and make their way to a prearranged rendezvous by using cover of darkness and every form of concealment offered. If a ski detachment unexpectedly meets the enemy and there is no chance of avoiding action, the commander should attack with the full force of his fire power in an attempt either to destroy or to force a retreat.

At the same time, the commander must ensure that the attainment of the main objective is not lost sight of.

As a rule the attack should be carried out simultaneously on all sides, cutting off the enemy's retreat. Before the attack, telephone wires leading out of the enemy's position should be cut. Not a single enemy should be allowed to escape to communicate the news of the attack to enemy commands.

After breaking into the enemy position, ski troops should attempt a rapid decision by the fire of weapons, by hand greandes, and with the bayonet. As soon as the task is completed, a ski detachment should move as far away from the objective as possible. If the attack is unsuccessful, the detachment should retire as rapidly as possible to avoid being surrounded.

When the objective has to be held the commander of the ski detachment must:

(a) Send reconnaissance parties ahead in the more important directions;

(b) Organize an all-around defense at a distance to insure effective support by the weapons of the main force;

(c) Defense must be organized with a view to the employment of automatic weapons, so that the bulk of the personnel can be used as a striking force;

(d) There should be economy in the use of ammunition, and snipers should be employed as much as possible against single targets or small groups of the enemy;

(e) Report back the situation immediately.

g. Security, Reconnaissance, and Movements

Security elements of a ski detachment should be particularly well organized and alert. Sentries must be frequently checked at night.

It must be realized that any relaxation in security measures in the rear of the enemy may be very costly and, therefore, all security patrols should be in a constant state of readiness, with their weapons close at hand for use at any moment.

Reconnaissance by a group of battalion strength should be assigned only to the main objective. Rifle companies may be used for secondary tasks and platoons employed for reconnaissance patrols. Detachments up to a company in strength carry out reconnaissance by the use of patrols.

If the attainment of the objective makes unavoidable a move by day under conditions of good visibility, the commander should exercise particular care in selecting a well-concealed route. A route thus selected should be checked by air observation if possible.

Movement of ski detachments in the rear of the enemy as a rule should be carried out cross-country, avoiding the use of roads; special attention should be paid to preliminary planning and organization. A ski movement lengthens a column four or five times; therefore, the first consideration is to try to shorten columns. The best marching order for a company or a battalion on skis is a column of fours with a distance of 6 yards between ranks and an interval of 2 yards between skiers.

h. Bivouacs

Ski detachments operating in territory occupied by the enemy must camp in thick underbrush or woods, and only in exceptional cases in towns and villages. When stopping for rest in a town or village cannot be avoided, the following precautions should be observed:

(1) Personnel should be billeted in whole detachments in a concentrated area, preferably isolated from other buildings;

(2) Commanders should remain with their detachments;

(3) Hostages should be taken;

(4) Local inhabitants should be prevented from leaving the area and a strict curfew imposed;

(5) Roads should be strictly patrolled, guards should be placed on all roads leading out of the area, and all persons attempting to enter or leave should be detained;

(6) Strict watch on all the inhabitants should be established to prevent them from communicating with the enemy;

(7) All wires should be cut.

Troops should bivouac in tents or in specially constructed shelters; skis and ski mountings should be placed to the right of the entrance; rifles, machine guns and ammunition must remain with the men. The following security personnel must be detailed: guards within the camp area, a routine guard, orderlies in each detachment, and patrol. All personnel should know definitely what to do in case of alarm. In order to be able to repel enemy attack, trenches should be dug in the snow, and weapons kept in constant readiness to open fire immediately. To insure a state of constant preparedness for battle, as well as uninterrupted rest, provision should be made for all-around defense at a sufficient distance from the camp area to permit assembly and preparation for battle after the alarm is given. The strictest discipline in opening and maintaining fire at night should be enforced. The fire should be opened only by order of the commander. All traces of the presence of ski troops at halts and camp sites should be carefully eliminated.

16. NOTES ON JAPANESE OPERATIONS

In some instances the fighting in Guadalcanal has developed new tactical problems which the terrain and general climatic conditions have aggravated.

The following brief report presents some notes on Japanese tactics submitted by a U.S. observer recently returned from the South Pacific Theater. These notes represent the observer's own conception of the situation based on personal conversations and contacts established at different points. It should be remembered that the visits made at various points in this area were of only a few days' duration.

a. General Tactics

The Japanese attack in force was regularly preceded by a 10-to 14-day cycle of events. This cycle included the following activities:

(1) Continued landings from destroyers each night for a period of 7 to 10 days;

(2) Shelling of the position by cruisers and destroyers standing off shore about 4 miles (The same naval force that executes the landings proceeds by the position, shelling it from 1 to 2 hours. This is obviously possible only when the

Japanese have local control of the sea.)

(3) Heavy bombing raids of 20 or more bombers, escorted by Zero fighters, generally between the hours of 1100 and 1400;

(4) Finally, combined shelling, bombing, and land attack by the Japanese forces, who by this time have organized all their forces ashore, completed their reconnaissance, and marched into position near the MLR.

Comment: In their movement toward the defensive position, the main Japanese force is preceded by a patrol of senior officers. These officers attempt to determine the weak spots in the position. If the patrol is killed or surrounded the main Japanese force continues on regardless, without apparent effort to complete their preliminary reconnaissance or make any deviation from their original plans. On numerous occasions, it was quite obvious that once the Japanese had committed themselves to a plan of attack, they would not alter the plan, regardless of the resistance encountered. In certain instances, attacking forces, after being halted by machine-gun fire, have withdrawn and reorganized a second and even a third time, until all have been killed.

b. Night Attack

At night the Japanese attempt to draw the Marine's fire by rattling sticks, etc. If the Marines open fire, the Japanese immediately fire in the direction of the flash. Marines cannot accurately return this fire, as the Japanese use flashless powder. At night, in close combat, the Japanese use hand grenades, identifying their target by the flash from the Marine's rifles.

Japanese troops have not surrendered under any condition. They have committed suicide or killed each other rather than surrender. When he indicated an intention to surrender, the Japanese did so only in order to gain the advantage to kill his enemy. The Marines caught on very soon to these treacherous tactics.

MECHANIZED VEHICLES

17. LESSONS FROM ARMORED OPERATIONS

The following report contains several lessons learned as a result of British armored operations in the Middle East.

a. Smoke Shells

Smoke shells have been very effective. In a tank versus tank action, they are used to blind enemy antitank and other supporting weapons, either as a screen, or as a general cloud over the enemy's position. It is an accepted fact in North Africa that conditions of very poor visibility, such as obtain when smoke is used, always hamper the defending guns more than the attacking tanks.

b. 57-mm Antitank Gun

The tactical employment of the 57-mm (British six-pounder) antitank gun differs little from that of the 40-mm (British two-pounder) antitank gun. The 57-mm guns must always be fired from an emplaced position except in hit-and-run operations, and even then if time permits. Digging in, camouflage, and the withholding of fire until a hit is certain, are all of vital importance; if the gun has been discovered, fire should be opened at once.

c. Motorized Battalion

The motorized infantry battalion is an integral part of the armored regiment during all operations. It normally accompanies the combat troops, and very rarely marches with the supply echelon. This battalion is equipped with sixteen 57-mm antitank guns, 12 heavy machine guns, and 4 heavy mortars. It is organized very flexibly and is highly mobile. Individual companies of this battalion are nearly always decentralized and attached to armored battalions forming a part of the regimental group. Various roles which have been alloted to the infantry of this motorized battalion are as follows.

(1) Flank Guard

An armored regiment during operations at Sidi Rezegh, concerned with the security of its left flank, sent out its motorized battalion as a security patrol. The battalion successfully accomplished this mission.

(2) Night Operations

Whenever possible, armored regiments are protected by patrols formed from the motorized battalion. These patrols operate about 3 miles from the bivouac area as a guard against surprise attacks. Sometimes they form combat patrols, but it should be noted that they cannot be used both day and night for any length of time with efficiency.

(3) Antiairborne Attack

The motorized battalion can be used as a highly mobile force in readiness to guard against possible parachute or airborne attack directed at vital installations within the division area.

18. GERMAN METHODS OF ARMORED ATTACK BY SMALL UNITS

The following report is from a lecture by a British colonel who recently returned from the Middle East where he commanded the artillery of a corps in the Western Desert. His lecture was based on both personal experience and intelligence reports.

a. Composition of German "Box" (Moving Defense Area)

The box is the part of the column which is inside the solid line in sketch C. The box varies in size, but if an armored battalion is the basic unit, it might contain the following combat troops, in addition to the service elements:

- One battalion of motorized infantry, usually carried in half-tracked, lightly armored vehicles;
- One battalion of 50-mm antitank guns;
- One battalion of 88-mm antiaircraft-antitank guns;
- One battery of 150-mm close-support infantry guns, sometimes on self-propelled mounts;
- One battalion of field artillery.

On the move or in the attack, the guns within the box are disposed as shown in sketch C. Infantry guns and field guns are usually kept in the box only when the defensive is assumed.

In size, the box is approximately 2 miles deep and has a front of 800 yards. The 88-mm gun, though it has proved a very effective antitank gun, is primarily included in the box to protect the lightly-armored vehicles from air attack.

b. The Method of Advance (see sketch A)

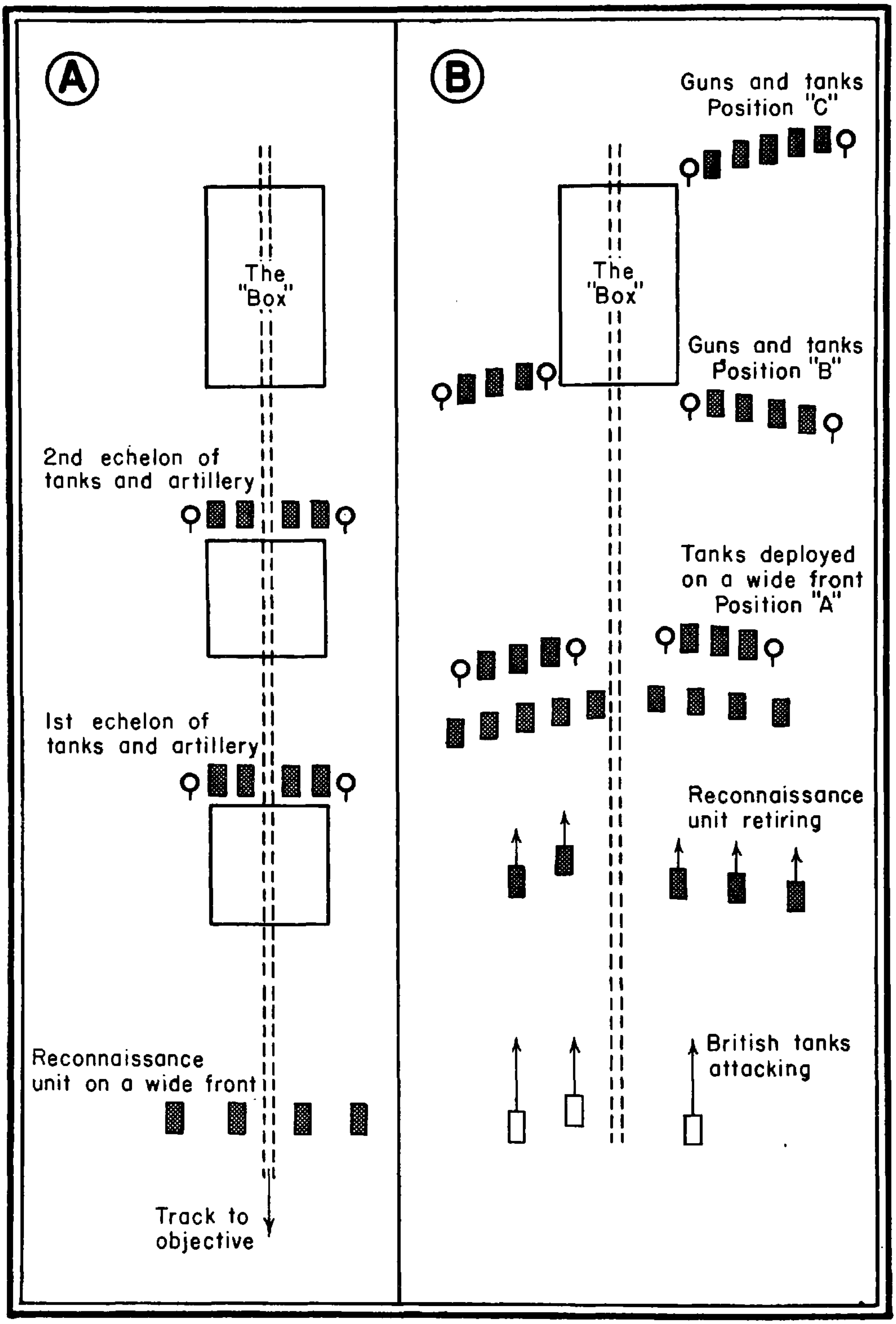
On very flat country, the distance between the reconnaissance unit and the leading echelons of tanks is from 5 to 10 miles; the distance between the 1st and 2nd echelon of tanks is 1 mile, and the distance between the 2nd echelon of tanks and the box is 2 miles.

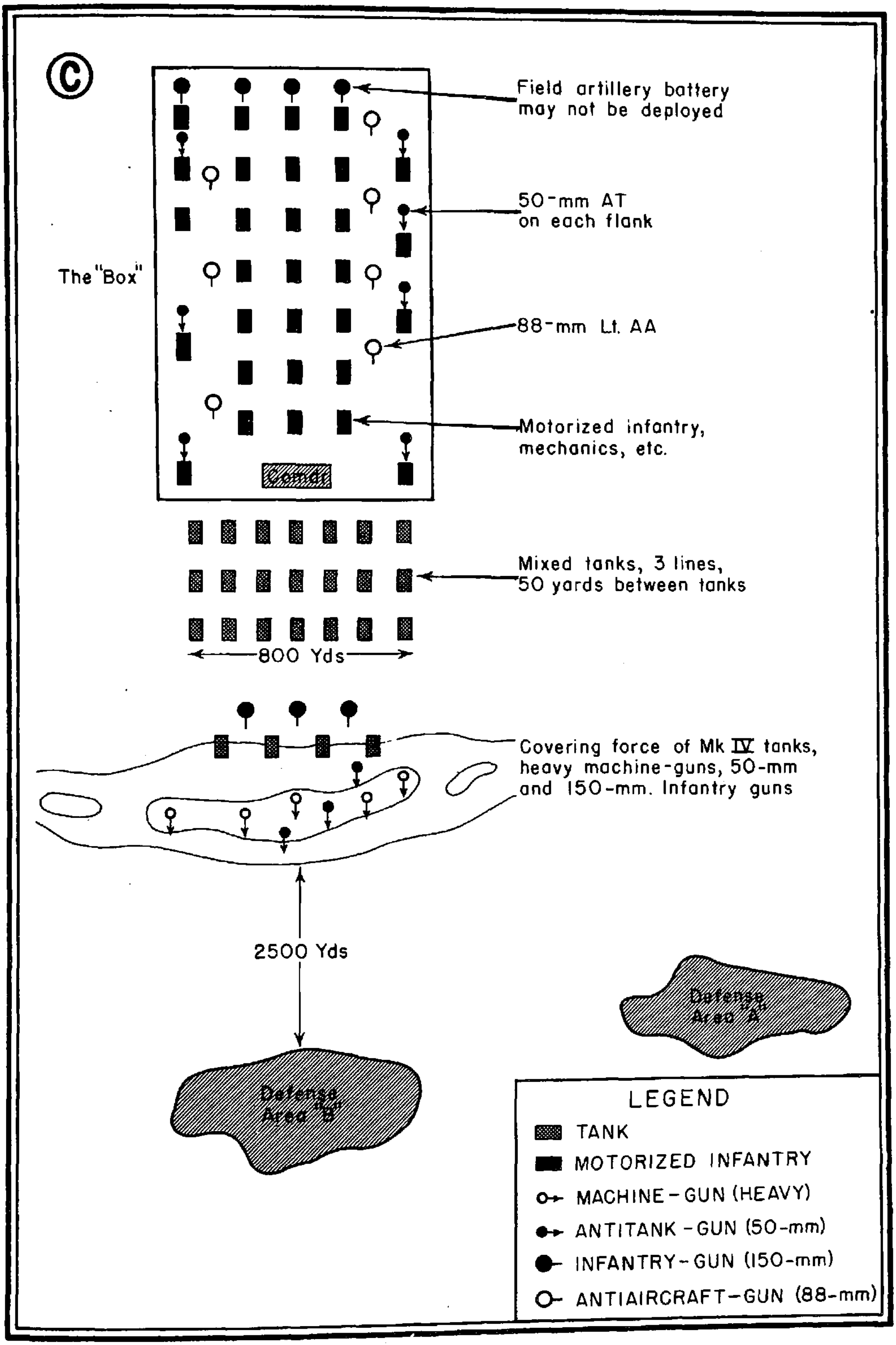
The whole force is directed towards some terrain feature, which, if captured, will force the enemy to fight on ground chosen by the attacker.

Over normal terrain, each portion of the column moves from high ground to high ground by bounds. Each echelon of tanks is supported by artillery which moves in the rear of the tanks.

c. Tactics if Attacked on the Move

When British tanks are reported to be advancing to a fight, the box halts and takes up a position for all-around defense. As the British tanks advance, the reconnaissance units fall back, and the two echelons of tanks deploy on a wide front (see sketch B). If the enemy continues to advance, the Germans continue the retirement to position B (sketch B), and force the enemy to attempt a break-


A
The "Box"
2nd echelon of tanks and artillery
Ist echelon of tanks and artillery
Reconnaissance unit on a wide front
Track to objective
B
Guns and tanks Position "C"
The "Box"
Guns and tanks Position "B"
Tanks deployed on a wide front Position "A"
Reconnaissance unit retiring
British tanks attacking



C
The "Box"
Field artillery battery may not be deployed
50-mm AT on each flank
88-mm Lt. AA
Motorized infantry, mechanics, etc.
Comdr
Mixed tanks, 3 lines, 50 yards between tanks
800 Yds
Covering force of Mk IV tanks, heavy machine-guns, 50-mm and 150-mm. Infantry guns
2500 Yds
Defense Area "A"
Defense Area "B"
LEGEND
TANK
MOTORIZED INFANTRY
MACHINE-GUN (HEAVY)
ANTITANK-GUN (50-mm)
INFANTRY-GUN (150-mm)
ANTIAIRCRAFT-GUN (88-mm)

through against one of the flanks of the box.

If the enemy decides to attack the German left flank, the troops on the left of the box at position B fall back to position C. The enemy tanks, if they pursue, are then not only engaged frontally by the German tanks from position C, but are caught in flank by AT and AA guns of the left side of the box. Finally, the tanks to the right of the box at position B swing around and engage the attackers in the rear.

If artillery has accompanied the tanks in the advance, it may either continue to support them, or enter the box to stiffen its antitank defense.

d. Attack Led by Tanks Against an Organized Position

In general, the Germans assume that the defenders have seized and occupied the best positions; hence, they attempt to overwhelm him and take over such positions.

The German commander usually launches a frontal attack against one center of resistance. The attack might be developed in the following way (see sketch C).

Phase I: The German commander will reinforce his reconnaissance unit with tanks deployed on a wide front and drive in the covering force, until the enemy is approximately 2,500 yards from the main line of resistance.

Phase II: A careful reconnaissance will then be carried out by a senior commander in a tank.

Phase III: The German covering force deploys as follows:

Tanks, generally Mark IV's, take up a hull-down position on a ridge, or high ground, and with the fire of their machine guns attempt to pin down the defenses. They may engage AT guns that are visible with their 75's. Under cover of this fire, 50-mm AT guns, heavy machine guns, and close support 150-mm infantry guns are also deployed in an attempt to knock out the AT guns of the defense, or to kill their gun crews.

Under the cover of fire of this covering force, the attack forms in rear as follows:

(1) Three rows of tanks about 50 yards apart, each row approximately 150 yards in rear of the one in front.

(2) When the tanks are in position, the box forms up in rear as shown in sketch C, the infantry all riding in vehicles.

Phase IV: At H hour, the whole force moves forward at about 15 mph, depending on the ground. As they pass through their covering force, the tanks begin to fire, not so much with a view to hitting anything, but for the psychological effect and to keep the defenders pinned down. On arrival at their objectives, some tanks drive straight through to the far side of the objective, while others assist their infantry in mopping-up operations. The infantry does not usually dismount until they arrive at the objective, when they fan out and use tommy guns extensively.

Phase V: When the attack is successful the covering force moves forward into the captured area to stiffen the defense. The tanks are usually withdrawn and serviced near what has now become their rear area.

19. SIMULATED TANK ATTACK

Several reports have been received in the past which indicate that the Axis forces in the Middle East use many ruses to simulate tank attacks (see Tactical and Technical Trends, No. 12, p. 33). The following report indicates another ingenious method.

During the attack on Benghazi in January 1942, German infantry advanced in motor vehicles. These vehicles advanced in line, and had chains fixed between them. These chains trailed along the ground and raised a considerable dust. This gave the impression that a tank attack had been launched. *Volkswagen* (comparable to U.S. quarter-ton vehicle) and armored cars have also been camouflaged to simulate tanks.

20. RUSSIAN TANK TACTICS AGAINST GERMAN TANKS

The following report is a literal translation of a portion of a Russian publication concerning the most effective methods of fire against German tanks.

* * *

a. Manner of Conducting Fire for the Destruction of Enemy Tanks

For the successful conduct of fire against enemy tanks, we should proceed as follows:

(1) While conducting fire against enemy tanks, and while maneuvering on the battlefield, our tanks should seek cover in partially defiladed positions.

(2) In order to decrease the angle of impact of enemy shells, thereby decreasing their power of penetration, we should try to place our tanks at an

angle to the enemy.

(3) In conducting fire against German tanks, we should carefully observe the results of hits, and continue to fire until we see definite signs of a hit (burning tanks, crew leaving the tank, shattering of the tank or the turret). Watch constantly enemy tanks which do not show these signs, even though they show no signs of life. While firing at the active tanks of the enemy, one should be in full readiness to renew the battle against those apparently knocked out.

b. Basic Types of German Tanks and their Most Vulnerable Parts

The types of tanks most extensively used in the German Army are the following: the 11-ton Czech tank, the Mark III, and the Mark IV. The German self-propelled assault gun (Sturmgeschütz) has also been extensively used.

In addition to the above-mentioned types of tanks, the German Army uses tanks of all the occupied countries; in their general tactical and technical characteristics, their armament and armor, these tanks are inferior.

(1) Against the 11-ton Czech tank, fire as follows:

(a) From the front--against the turret and gun-shield, and below the turret gear case;
(b) From the side--at the third and fourth bogies, against the driving sprocket, and at the gear case under the turret;
(c) From behind--against the circular opening and against the exhaust vent.

Remarks: In frontal fire, with armor-piercing shells, the armor of the turret may be destroyed more quickly than the front part of the hull. In firing at the side and rear, the plates of the hull are penetrated more readily than the plates of the turret.

(2) Against Mark III tanks, fire as follows:

(a) From the front--at the gun mantlet and at the driver's port, and the machine-gun mounting;
(b) From the side--against the armor protecting the engine, and against the turret ports;
(c) From behind--directly beneath the turret, and at the exhaust vent;

Remark: In firing from the front against the Mark III tank, the turret is more vulnerable than the front of the hull and the turret gear box. In firing from behind, the turret is also more vulnerable than the rear of the hull.

(3) Against the self-propelled assault gun, fire as follows:

(a) From the front--against the front of the hull, the drivers port, and below the tube of the gun;

(b) From the side--against the armor protecting the engine, and the turret.

(c) From behind--against the exhaust vent and directly beneath the turret.

(4) Against the Mark IV, fire as follows:

(a) From the front--against the turret, under the tube of the gun, against the driver's port, and the machine-gun mounting;
(b) From the side--at the center of the hull at the engine compartment, and against the turret port.
(c) From behind--against the turret, and against the exhaust vent.

Remarks: It should be noted that in firing against the front of this tank, the armor of the turret is more vulnerable than the front plate of the turret gear box, and of the hull. In firing at the sides of the tank, the armor plate of the engine compartment and of the turret, is more vulnerable than the armor plate of the turret gear box.

21. GERMAN 200-MM SPIGOT MORTAR BOMB

It is now established that a new weapon has been introduced into service in the German Army and is known as the 200-mm spigot mortar. It is intended for the destruction of obstacles, minefields, and gun emplacements.

a. General

The mortar appears to be of normal spigot design,* except that fixed ammunition is not used, the propellant case being attached to the top of the spigot before the bomb is loaded.

The projectile appears to have an egg-shaped body, containing the explosive charge, and has a long tubular tail with fins at the base (see accompanying sketch).

It would seem from the figures quoted below that the explosive charge constitutes a very high percentage of the weight of the bomb itself, excluding the tail-piece. The ratio may be up to 70 or 80 percent. It is clear, therefore, that there will be considerable blast effect with comparatively little fragmentation.

The blast would give good effect against personnel. The effect against concrete and armor would also be high. Presumably the weapon would be used to produce a lane through minefields, the mines being destroyed by sympathetic detonation. It is not considered, however, that the effect would be sufficiently great to represent a very substantial advance in minefield clearance methods.

Based on the charge and weight of the projectile, it does not seem likely that the maximum range will exceed 500 yards. The provision of three charges indicates that there is a very low minimum range, and it is possible that the recent incendiary projectiles, reported as having a range of only 200 yards, may be a version of this projectile fired from the same weapon.

In spite of the large caliber of the weapon, it seems certain that it will not be unduly difficult to manhandle. It can be effective as airborne or parachutist equipment.

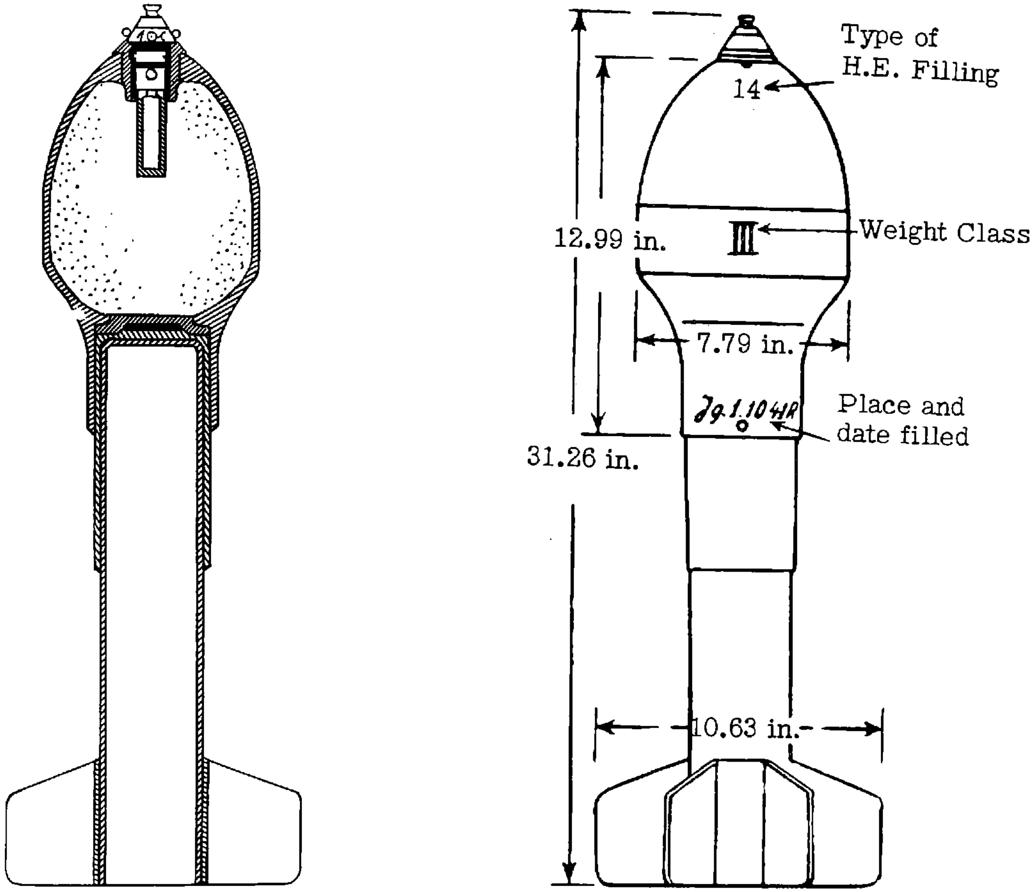
The possibility of an incendiary filling has been noted. There is also no reason why a smoke or chemical filling could not also be used.

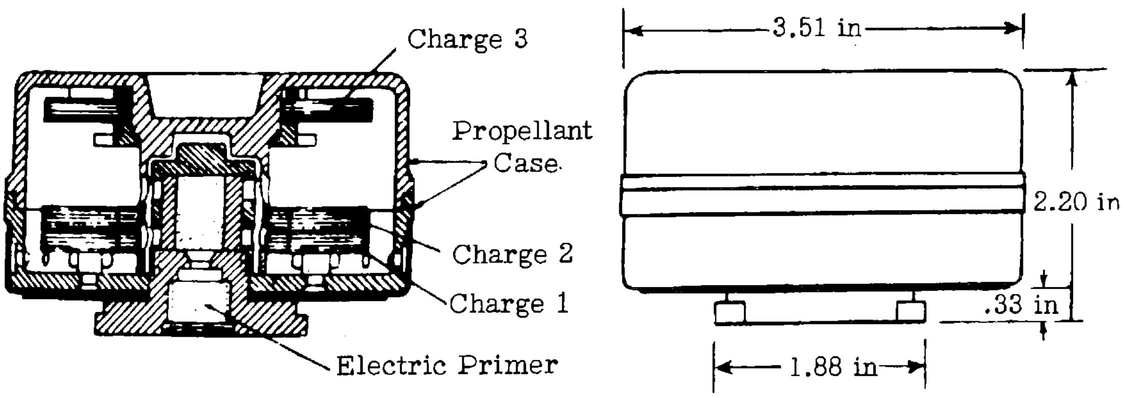
b. Model 40 HE Bomb

This is a nose-fuzed bomb with a high charge-weight ratio, and is fitted with a tubular tail with 8 stabilizing fins.

*The spigot is a rod extending up through the tubular tail of the mortar bomb. Traverse and elevation are directly controlled by manipulation of the spigot; the tube simply serves to confine the blast of the propellant.

MODEL 40 BOMB FOR GERMAN
200-MM (7.87 IN.) SPIGOT MORTAR





PROPELLANT CASE

Range, estimated	200 to 500 yds
Weight of bomb, filled	46.75 lb
Diameter	7.79 in
Diameter of tail fins	10.6 in
Total length of bomb	31.26 in
Length without fuze or tail	12.99 in
Diameter of spigot	3.5 in
Weight of TNT filling (approx)	15 lb

The fuze can be set for instantaneous or delay action. The three charges weigh 540,370 and 185 grains, respectively. The propellant is nitroglycerine ring powder, and is contained in a steel propellant case fitted with an electric primer.

QUARTERMASTER

22. GERMAN 21ST ARMORED DIVISION--DIVISION SUPPLY

The German Afrika Korps has, at least until somewhat recently, operated very successfully in North Africa. No small part of this success can be attributed to an efficient German supply system.

According to prisoner of war statements the division supply elements of the German 21st Armored Division (Afrika Korps) consisted of a supply company and 12 supply columns.

The 12 supply columns consisted of 4 heavy columns, 7 light columns, and 1 gasoline and oil column. A heavy column had 24 vehicles with an aggregate capacity of 60 tons; a light column had 12 vehicles with an aggregate capacity of 30 tons. The 12 columns, exclusive of the gasoline and oil column, thus has a total cargo capacity of 450 tons.

The supply company was actually an Arbeitskompanie or labor company. Its function was to cooperate with the division supply columns by carrying out such tasks as unloading, establishing dumps, maintenance, etc. The strength of the company was estimated at from 200 to 250 men.

The division was reported to maintain 3 supply dumps--one each for Class I, Class III, and Class V supplies--which were close together and forward of which supplies were never moved by division transport. It was the function of unit transport to move supplies to the front from these dumps. The operating radius of both the supply columns and supply company was said to be from 100 to 200 kilometers (60 to 120 miles).

23. WATER SUPPLY OF A GERMAN TANK BATTALION IN LIBYA

The following report gives one example of the problem of supply of troops operating in the desert. A German tank battalion, leaving Tripoli for El Agheila in 1941, took the following water supplies for three days' march:

Unit	For Engine Cooling	For Washing Purposes
Headquarters Company	122*	150
5th Company (light)	111	100
6th Company (light)	114	100
8th Company (medium)	93	100
Total	440	450

*All figures refer to the number of containers carried by the particular unit; each container held about 5 gallons.

The above containers were distributed throughout the battalion as follows: one container per car; two containers per truck, half-track, armored car and light tank; three containers per medium tank.

This quantity of water represented only one-third of the total amount that had to be taken. The remainder was carried in a special water column, and provided about 2 gallons of water per man for the three-day period. The distribution among vehicles was in proportion to the number of personnel carried.

Each company carried 130 containers with water for cooking. These containers were carried on the supply trucks which accompanied the field kitchens.

The total amount of water carried by the battalion was as follows:

Cooling	5,100 gallons
Washing	2,250 gallons
Cooking and Drinking	4,465 gallons
Total	11,815 gallons

A comparison of the amounts per man per day between the British and Germans is as follows: the Germans allow 2/3 of a gallon for washing, 1 1/3 for cooking and drinking; the British allow 1 gallon for washing, and 1 for cooking and drinking.

24. VARIETIES OF JAPANESE UNIFORMS

Recent experience in operations has shown that the Japanese do not wear a strictly standardized uniform. The divergence of the varieties so far encountered is shown in the reports given below. The only unanimity in the reports seems to be on the slovenly appearance of the troops.

The uniform is varied and the following combination of dress has been observed:

(1) Khaki blouse and trousers, puttees and rubber-soled shoes;

(2) Khaki blouse, blue (denim) trousers, puttees and rubber-soled shoes;

(3) White shirt, khaki trousers, puttees and rubber-soled shoes.

The shoes seem to be always the same type, and for jungle fighting are probably superior to heavy shoes.

The Japanese usually carry no equipment apart from a belt containing ammunition pouches. However, packs, haversacks, and large map cases have been captured, so they are apparently worn in some cases. Water-sterilizing outfits are also carried.

There was nothing uniform about the clothing; some wore white shirts, some green, and some khaki. Steel helmets were worn by some, while others wore cloth caps. All that were observed had knee breeches, and some sort of leggings.

In one instance in Burma a British officer reported that the Japanese were all dressed in khaki breeches, and had a yellow star on their field caps with a blue and white shell (cornucopia-shaped) badge above the star. He presumed that this was some regimental insignia. Officers and senior NCOs all had a long curved sword which they always wore.

A British soldier reported that the Japanese dress was mixed and always very dirty. Trousers and puttees, and in some case heavy shoes, were worn, or else the common split-toed rubber shoe.

In Malaya, the color of the uniform used by the Japanese was khaki or khaki-green, with the trousers tapering at the ankle. In Borneo the uniform worn was a brownish-gray color; reconnaissance patrols wore only shirts, shorts, and light-weight shoes with rubber soles. The uniform worn by naval landing troops is gray-green, and is hard to distinguish from the uniform worn by the Dutch in the Netherlands East Indies.

25. GERMAN AUTOMATIC METEOROLOGICAL TRANSMITTER

This meteorological transmitter was found to be located in the open on land, and serves a purpose similar to the larger, floating meteorological stations known to be used by the enemy.

The full equipment comprises a complete low-power, short-wave transmitter, automatically operated by meteorological instruments, to record the temperature and pressure in the locality in which it is stationed. The times and periods of transmission are set on a master clock.

The transmitter is a Lorenz crystal-controlled, four-tube transmitter made in 1940, operating over two wave bands: 17.5 to 6.6 and 6.6 to 5.6 megacycles per second. The tubes are master oscillator, frequency-doubler, and two 15-watt output tubes, in what appears to be a push-pull circuit. Continuous wave or interrupted continuous wave can be transmitted when the transmitter is switched on by the clock mechanism. This transmitter is obviously a factory production and is well mounted in a tubular frame, but the whole is encased in a weatherproof container of doubtful efficiency and "workshop" finish. The clock unit was also in this container, but was sealed in its case with a waxed-wood cover and a waterproof packing.

The meteorological controlling unit is a Morse-sending device, the signals sent being altered by the positions of three contactors, and the contactors being moved by the meteorological instruments. In addition, a further contactor is hand-set, presumably to pick out the recognition signal of the meteorological station. The operating meteorological devices consist of a curved bi-metallic strip for registering the temperature, and two barometers, one with twin capsules (coarse reading), and the second with four barometric capsules (fine reading). It is necessary to provide two barometric devices in order that the full reading may be obtained. It is thought that the first instrument will transmit a signal indicating the nearest millimeter, and the second will provide the decimal part of the local pressure reading. The contactors, operated by a geared-up rack-and-pinion movement, are in the form of 10-finger stars with sharpened points, arranged around the circumference of a circle. The result of a change of temperature or pressure is to alter the position of these points relative to the axis of this circle. The rotor, or contact arm on which these contactors operate, consists of a sector-shaped piece, the circumference of which moves around the circle inscribed by the contactors. The sequence is that the sector first makes contact with the identification signal, then with the coarse barometer, the fine barometer, and finally, the thermometer contactor.

It should be understood that, according to the setting of the contactors, a different signal is picked up by the projecting fingers. Anyone receiving this signal can ascertain the position of the contactor, and hence the temperature or pressure at the moment of transmission, if the key of the coding on the rotor arm is available.

The clock is an elaborate mechanism for performing the simple task of making contact between two leads for the periods of transmission. It consists of an electrically wound clock which registers the time by means of a rotating

disk, engraved with the 24 hours. The switch operating devices are secured by means of two thumbscrews around the periphery of this disk. The two leads, "shorted" by the clock, switch on the transmitter and meteorological unit. There are two batteries in the set: one a 24-volt, 69-ampere hour, low-voltage unit, contained in a weather proof metal case, 3 feet 6 inches by 1 foot square; the other, a high-voltage battery consisting of four 90-volt cells connected in series. The latter was of similar type and construction but of 11-ampere hour capacity.

26. GERMAN ARMY SIGNAL REGIMENT

There is evidence of the existence of a German signal regiment organized as follows:

1 Battalion	1 Company	Radio company
	2 Company	Armored signal company
	3 Company	Intercept company
2 Battalion	4 Company	Wire-laying company
	5 Company	Telephone operating company
	6 Company	Telephone operating company

While it is doubtful whether the intercept company was ever activated, it reportedly consisted of three platoons, whose respective functions were radio intelligence, intercept, and direction finding. The strength of the regiment is 45 officers and 1,674 enlisted men.

GENERAL

27. AIDS TO MOVEMENTS AT NIGHT

The following two methods of marking lanes through minefields, and routes for troops moving through the desert have been recommended as being most effective. They are simple to construct, and are not apt to be misunderstood.

a. For Marking Lanes through Minefields

Remove the lid from an ordinary tin can, and fill it with Diesel oil to within one-half inch of the top. Fix a piece of wire screen over the top and run several pieces of ordinary twine through it. This twine should project about three-quarters of an inch over the screening. The lamp will burn for 8 to 10 hours after being lit.

The lamp is then covered with a larger tin can. Cut an arrow in the side of the larger tin can, and cover on the inside with a strip of oiled paper. The arrow is obscured from air observation by means of a strip of metal. Experiments have shown that the light can be plainly seen at night at a distance of 150 yards. The lamps should be staggered on either side of the lane.

b. For Marking Routes for Troops

Remove the lid of a gas or water can, half-fill with sand, and saturate the sand with undiluted gas. When lighted, this will burn for about 1 1/2 hours. It can be seen for about 550 yards.

28. SELECTIONS FROM JAPANESE FIELD INSTRUCTIONS

The task of interpreting Japanese tactics is considerably facilitated by a study of their own documents. The following extracts taken from translations of Japanese field instructions contain many concrete admonitions as to the action of small units in combat conditions.

* * *

a. Morale

The unit commander himself must not give up hope or make pessimistic statements. In a battle always remember the "4 to 6 ratio" - if 4 of our men are knocked out, consider that we have got 6 of the enemy. Whatever may be our own losses, keep up morale. The more violent the fighting, the calmer and firmer must be the commander's bearing, orders, and words of command. It is also important, for the encouragement of morale, not to let the personnel of the unit know the number of killed and wounded, or their names.

In operations when our positions face those of the enemy, the most unpleasant thing is to see the tendency of our own personnel to fall into a passive attitude. This is the reaction of ambitious men who say "getting killed in our own positions is the same as being slaughtered without resistance. Our father and brothers are going to be ashamed of us. If I am going to be killed, I want to die fighting"--so this attitude is not to be construed as the result of cowardice. Although it may be a difficult task, the men must be made to feel that they are on the offensive, even when they are in a defensive position. For this purpose, it is necessary to carry out fierce counterattacks from time to time. With us, the fiercer the fighting, the higher our morale.

Heavy enemy shelling greatly affects morale, and sometimes troops will not fight as they should. The effect is still more marked when it results in casualties. Unit commanders must strive to stimulate morale, and be careful of their own actions and attitude. (At such times the men always watch the expression on the commander's face.)

To eradicate the sense of fear in raw soldiers, killings with the bayonet should be carried out whenever an opportunity occurs. Raw troops, being unused to fighting, suffer relatively heavy casualties, and attention should be paid to this point.

Before going into action, succession of command must always be clearly indicated. Unless this succession is defined right down to the last soldier, and training carried out until this becomes practically automatic, fighting may become confused if the unit commander becomes a casualty. When the unit commander is killed or wounded, the effect on the personnel is extremely great, and morale tends to decline. On the other hand, even if one man after another is killed, and the situation is tragic, if the men see their commander's face full of vigor, their courage increases a hundred-fold.

"After victory, tighten your helmet strings" says an old Japanese proverb. After fierce fighting, or during a pause in the battle, the mind is apt to relax. This is the most dangerous moment. Even men who are daring and determined during a charge, have a tendency to be cowardly as soon as the fighting changes to mopping-up operations, and only scattered fire and small numbers of enemy troops are encountered.

b. Expenditure of Personnel

As a landing party staff officer says in his "Instruction in Practical Strategy": "Would you throw away the lives of your men, who have been given into your keeping by the Emperor, by recklessly sending them on a frontal charge in the face of the enemy fire, ignoring your own shortcomings in leadership and strategy?" As a commander, bear this well in mind. In a word, your objective must be to attain the greatest results with the smallest sacrifice. If you order your men to advance, they will obey you in any circumstances and at all times. But remember that before doing this, you are to take the minutest precautions. Do not forget to explain to your men, as carefully as if they were little children, how and in what direction to advance, the places to watch, and what to do when shelled or attacked by hand grenades. For example, how many men would have come through unscathed if they had been ordered to lie down--"to get down until your head is on the ground." This may sound like a graceless criticism of men who have given their lives, but we believe many men have become casualties through their own carelessness and want of caution. It is true we have dedicated our lives to the Nation and will not begrudge them at any time, but we want to accomplish something by our death, and not to die uselessly. We want to die gloriously. We hope for a death worthy of a Samurai, like Lieutenant X, and we owe it to the men under our command to enable them to do likewise. If you do this, as the commanders of a unit you will have a measure of peace of mind.

Too much eagerness to do something outstanding must be strictly avoided; it has sometimes led to heavy losses. This is particularly true of units going into action for the first time. Some young soldiers think it heroic to expose themselves to the enemy; take care of this, particularly in a battle of positions.

Too long a wait in the same area will result in drawing concentrated fire from the enemy, and is inadvisable. When moving, the proportion of hits from bullets is smaller than when halted. In a charge, if you meet concentrated fire from the enemy at close quarters and lie down and stay glued to the same spot, you cannot advance. Also, the longer you halt, the more your will to advance is blunted, and the greater your casualties. Therefore, charges must be made with determination and daring. In this way, your casualties will be smaller, and your morale will be improved. If you act with determination, even the Gods will ward off harm, and in the midst of death there will be life. [Translator's note-Nothing really devotional about this - more a figure of speech than anything else.] A daring and determined attack is the key to victory.

c. Machine-Gun Units

In a naval landing party, there is practically no necessity for a machine-gun company. It is preferable to include in each company a machine-gun platoon under the command of the rifle company commander. From the nature of a naval landing party, there is practically no occasion on which a machine-gun company joins in the action as an independent unit with its machine guns. As a rule each platoon is detached, and is organized under the rifle unit company commander. This is particularly true in the case of street-fighting and fighting at close quarters. Even if a machine-gun company were independent, it would find it difficult to put up a vigorous fight without the support of the rifle units. Nowadays section training is the main consideration in machine-gun training, and the need for company exercises is not particularly felt.

All machine-gun personnel with the exception of the gunner must be armed with rifles. This is particularly necessary in street-fighting, fighting at close quarters, etc. Even when attacking and advancing, the carrying of rifles never impedes the advance. In case of an enemy attack, it is easy to make a sortie with the machine-gun ammunition personnel. The ideal rifle for machine-gun personnel is the short barrel rifle.

The loopholes of a machine-gun position must always be screened with pieces of cloth or matting. If the enemy can see through them, his snipers may fire at them, or he may concentrate his fire on them. This is particularly necessary in the case of apertures for heavy machine guns, which must be large on account of the angle of fire.

If two machine guns are used, they can be fired alternately, giving the enemy no pause for a counterattack, while the rifle units at the flanks must endeavor to create an opportunity for an attack. If is absolutely necessary to carry one shovel for each machine gun. If possible, four bags for sand should be carried for each gun.

The normal machine-gun squad should be increased by one man, and three boxes of ammunition should always be carried. Particularly in an advancing attack, there are occasions when replenishments from the rear do not arrive in time.

d. Sniping

When the enemy takes to fortified trenches to try to stop our advances, the greatest precautions must be taken against sniping. The enemy usually waits for an interruption in our fire to send a single deadly shot.

When confronting the enemy, do not put your head out for reconnaissance or observation more than once from the same place. A sniper will have his rifle sighted to get you the second time. There are times when you suffer through underrating the enemy.

When fighting is protracted, there is a tendency to get accustomed to the enemy, and relax vigilance against enemy fire and hidden enemies. We have been sniped time and again. Pay particular attention to this.

e. Equipment

The fireman's hatchet is necessary for emergency engineering work in street fighting. An ax is a little too big. The fireman's hatchet is best when confronted by an enemy at close quarters.

Canteens should be kep+ filled to capacity at every opportunity. Those who carry only a small quantity of water, claiming that heavy equipment impedes their movements, are always those that try to drink from other men's canteens later. Bear in mind also that when men go into action for the first time they feel particularly thirsty.

f. Attacks

The best time to halt an advancing attack is about 1500. If the attack is not halted until after dusk, there is danger of our defense against enemy attacks relaxing; besides, our fighting efficiency next day is bound to deteriorate. When an advancing attack is halted, we must immediately build a satisfactory offensive position and not leave anything undone that we may be sorry for when the enemy attacks.

When an area is captured, mopping-up operations should be carried out as quickly as possible, and our gains consolidated. Abandoned enemy corpses must be given the coup de grace.

In a charge, the platoon commander must be at the head, as indicated in the Manual. The charge is the moment when hardship and fatigue reach their climax, from the commander of the unit down to the last man. At this time, if everyone is determined to carry out the unit commander's orders without hesitation, and if the platoon commander advances at the head of his men, the spirit of daring and solidarity aroused in the company will enable them to penetrate the enemy position.

g. Miscellaneous

In maneuvers, we have always had it emphasized that we must know the tactical situation. During the battle of X a certain unit commander boasted that he had decided to make a charge and thereby greatly embarrassed his company commanders. We believe this was a case of blind decision. We had been ordered by the battalion commander to strengthen our position and defend it to the death - this means if your arms are broken, kick the enemy; if your legs are injured, bite him; if your teeth break, glare him to death. This spirit is expressed in the words "defense to the death. The time to launch a charge is when the enemy has reached the limit of exhaustion. In defense, we believe that if you can hang on to a position with one light machine gun, one platoon can successfully crush the enemy.

When wounded, the unit commander's permission must be obtained before leaving the firing line. If the unit commander is not in the vicinity, request should be made to another officer, or to an NCO of the section. This is clearly indicated in the Manual, and even if a man is ignorant of the regulation, common sense should tell him that this procedure should be followed. Sometimes a man leaves the firing line when his injuries are not such as to prevent him from continuing to fight. This is a most cowardly action.

No firing must be done at night. This is something we feel very keenly in the present fighting. Care must be taken in this respect, since it is the natural tendency when shot at, to shoot back. If we are maneuvered into firing by the enemy, we reveal our firing line, show him the position of our automatic weapons, and give him an outline on which he can base his tactics.

The enemy's camouflage is truly efficient. We have found it hard to discover him, and thereby have suffered unexpected losses. At over 500 yards, his camouflage cannot be distinguished, and great care must be taken. Training against camouflage should also be carried out.

The quickest means of communication after a battalion has deployed (with the exception of special orders) is by flag signalling if the visibility of the terrain permits. It is very important, therefore, for the commander of the unit headquarters not only to pay attention to the enemy, but also to keep in mind liaison with the commanders at the rear and flanks. It sometimes happens that when the fighting becomes particularly violent, the situation of every officer and man becomes absorbed by the enemy in front, and liaison with the commander has been temporarily cut off. Furthermore, where the terrain allows visibility, simple orders can be communicated much more quickly by flag signalling than if a number of runners are used over terrain full of "freaks," etc. Therefore, every member of a landing party should be proficient in sending and receiving flag signals.

29. FOOD FROM THE SAGO PALM

The pith of the sago palm is used for food in the Solomon Islands and all the land area east thereof, up to and including the Malay Peninsula. It can be a ready and substantial source of food when more normal means of subsistence are, for one reason or another, not available. This tree is found growing wild in almost every swamp, and near most streams and lakes. Unless planted and cultivated, it is not usually found on high ground.

a. Description

The full-grown sago palm reaches a height of over 25 feet and has a diameter of about 2 feet (see accompanying picture). The outer surface of the trunk is a hard shell of tough fibrous wood an inch or less in thickness, while the entire inner portion is filled with a soft pithy substance about the consistency of cheese, with numerous coarse, rather brittle fibers running through it. The pith at the lower end of the trunk is a brownish red in color, fading out to a pure white at the top.

The leaves are long, feather-like fronds with a thick midrib bearing long sharp spines. On mature trees the leaf stems or midribs range from 8 to 12 feet in length; they are so strong that the natives use them for building the walls of their houses. At the base, where they encircle the trunk of the palm, the leaf stems are concave in shape and have a diameter of around two feet. Young trees have the entire trunk covered with leaves, but as the tree matures those on the lower part of the trunk fall off.

b. Flowers and Fruit

When the sago palm is about 15 years old it sends up tall spikes of pink or reddish flowers at the top. The flowers later develop into clusters of nut-like fruit, dry and scaly, and somewhat resembling small pine cones but having a smooth shiny surface.

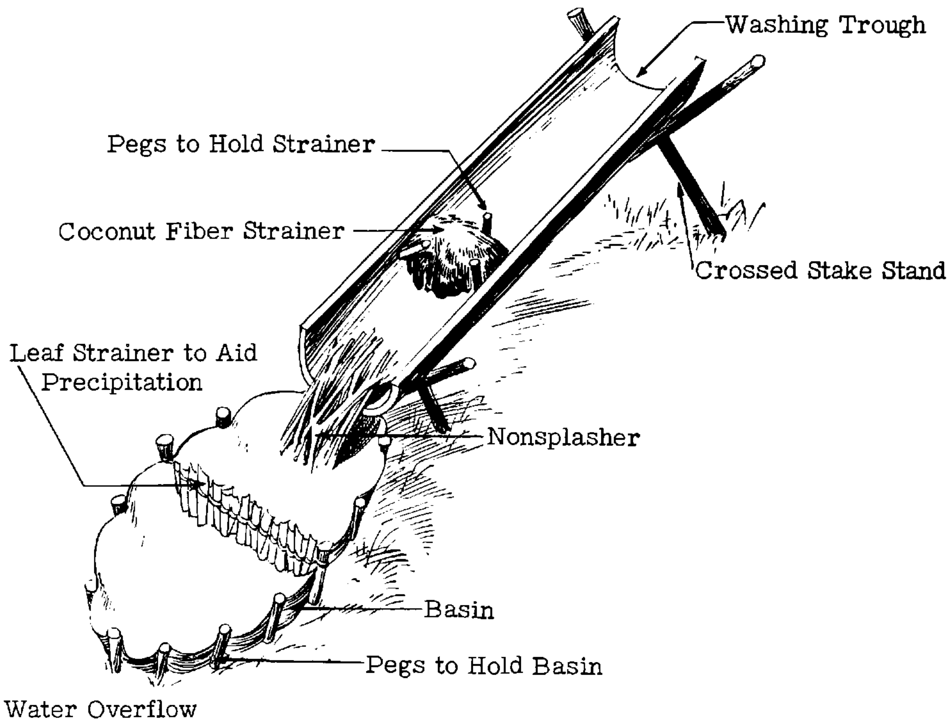
To obtain the maximum amount of sago, the natives cut the palm just before the flower develops, for if the fruit is allowed to mature it will absorb all the pithy substance and the tree will be little more than a hollow shell. A certain amount of sago could probably be obtained from younger trees several years before they reach maturity, but it would be more difficult to extract and the yield might not be worth the effort involved. However, it should not be difficult, in a large grove of trees, to locate some trees on which the flower stalks were visible but not yet fully developed. A tree on which the fruit had already appeared would be of no value.

c. Extracting the Sago

To obtain the sago from the standing tree is relatively simple. The tree is first cut down and the thin outer shell removed. If an axe, hatchet, machete, or similar heavy knife is available for cutting down the tree, no additional equipment is necessary, as the further stages in the operation can be carried out

SAGO PALM--DETAIL OF TRUNK AND FRONDS

with materials readily obtained in the forest. The outer shell having been removed and the pith exposed, the pith is cut and beaten into pulp. The next step is to mash the sago starch or flour from the pith (see sketch below).



The washing trough, in which the pulpy mass is placed, can be made out of the base of one of the sago-leaf stems. As the base of the leaf stem clasps the trunk, it is quite large and for a considerable distance is concave on one side so that it makes an excellent trough. The portion used is usually from eight to ten feet long, and is set up on stakes so that one end is lower than the other. The strainer at the lower end of the trough, through which the pulverized pith is washed, is usually made of the fibrous covering of the leaf stem of the coconut palm. The mashed pith is dumped into the trough and water poured over it to wash out the starch. During this process it is worked with the hands or pounded with a stick to break it up still more. The basin into which the starchy water runs may be another sago leaf stem or a container made of large flat leaves. After the starchy water has remained in this container for a short while, it separates into a precipitate of fine flour at the bottom and water on top. The water may then be drained off, leaving a mass of damp flour as the final product of the process. When wrapped in leaves (or put in an ordinary cloth bag), this keeps for weeks.

d. Cooking

The natives have two methods of cooking sago: in gruel and pancakes. Sago gruel is made by adding boiling water to a lump of flour and stirring it in a pot over the fire until the whole mixture has a uniform, thick consistency. The technique is similar to that of preparing oatmeal. The natives then dip out spoonfuls of the gruel onto leaves and allow it to cool. When cool, it is a gelatinous cake, which may be either eaten at once or kept for several days. Natives usually carry these cakes with them when they go on trips. To Europeans these cakes are rather flat and tasteless. This could probably easily be remedied by including some flavoring material in the gruel. Even the natives always eat some other food with the cakes to provide flavor.

The second method of cooking sago is to sprinkle a large lump of the flour with water and place it on a large pottery sherd (or a frying pan) over a fire, leaving it there for a minute or two. The lump is then lifted off, leaving a thin cake adhering to the griddle. This cake is turned, after being sprinkled again on top, and is cooked on the other side. The result is a rubbery pancake, which the natives do not like as well as the sago cakes described above, but which is more palatable to a European, particularly if spread with butter or jam.

e. Locating the Sago Palm

Although the sago palm grows wild in New Guinea and in parts of Melanesia, sago tracts are always owned by nearby natives. Therefore, if it is desired to keep on friendly terms with them, they should be compensated in some way before the trees are taken from their plots. Furthermore, in New Guinea at least, these plots are owned by a patrilineal lineage rather than by an individual. Hence, care should be taken to deal with the whole lineage or a representative thereof, rather than an individual who may claim ownership. A standard price per tree should probably be set, and consistently adhered to. The natives regularly try to take advantage of whites, and a bargaining arrangement would probably lead to trouble. It is reported that a price of about 25 cents for each tree would be adequate compensation, depending on local conditions.

Native culture in New Guinea often demands that a man shall perform one part of the flour processing while a woman does another. If this division is reversed or changed, it is often believed that the sago flour will be inedible. If, therefore, natives are hired to process sago, they should be permitted to choose their own teams.

The pidgin-English term for sago is "sack-sack." Information about the location of sago swamps may be obtained from native pidgin speakers by asking: "Where stop belong sack-sack?" The native may reply: "He stop long hap (pointing)" meaning "It is in that direction." If one wishes to be guided to the place one may say: "You showim me this fellow place belong sack-sack." The pidgin term for guide is "show man." If one wishes to know how much sago there is, one may inquire: "He got plenty fellow sack-sack long this fellow

place?" or "How much sack-sack he stop along this fellow place?" If the answer is "lick-lick" it means there is but little. "Plenty fellow" means a lot. "Hot water" is the pidgin-English term for boiled sago gruel, while "fry" or "fryim" is the term for the pancakes.

SECTION II

THE GERMAN ADVANCE FROM THE NORTH--KIEV OPERATION

THE GERMAN ADVANCE FROM THE NORTH--KIEV OPERATION*

INTRODUCTION

Upon entering Russia on June 22, 1941, the German Center Group of Armies under Marshal von Bock had little difficulty in effecting a double encirclement of the cities of Bialystock and Minsk. After this victory, von Bock again pushed his group of armies eastward and effected the encirclement of Smolensk, a strategically important city known as the "western gate of Moscow". Despite the fact that the capture of Smolensk (August 6) had proved costly, von Bock again thrust forward--this time apparently in an attempt to encircle Viazma. The fighting was bitter. The German Second Panzer Army was cut off by the Russians and was rescued only by a lavish use of air power. The spearhead of the Center Group of Armies was definitely brought to a halt by Marshal Timoshenko before Moscow.

THE KIEV OPERATION

After the failure of the German Center Group of Armies to make further gains toward Moscow, and after the similar failures of the North Group of Armies approaching Leningrad and the South Group before Kiev, the Germans initiated the great double encirclement, which is generally referred to as the Kiev Operation. It is not known whether this operation was envisioned before June 22, or whether it was attempted as the only large operation possible after the failure of the frontal attacks against the three great cities.

In any event, the plan was as follows: Kiev was to be enveloped and as many as possible of Marshall Budenny's armies were to be trapped and destroyed in a gigantic double pincers envelopment, or wedge and trap operation (see map at end of article). The holding attack, and the two southern pincers arms or the southern wedge were to be from the South Group of Armies under Marshal von Rundstedt. Von Reichenau's Sixth Army, which had been halted on the Irpen River west of Kiev, was to launch the holding attack. The Seventeenth Army of von Stuelpnegel and the First Panzer Army of von Kleist were to constitute the two southern pincers arms of the southern wedge. The wedge from the north was to be formed from the Center Group of Armies of Marshal von Bock. The Second Panzer Army under General Guderian and the Second Army under General von Weichs constituted the northern pincers arms. The outer pair of pincers, the two Panzer Armies, was to close about 125 miles east of Kiev.

Of course, no two double pincers or wedge-and-trap (Keil and Kessel) operations are exactly alike, but the Kiev operation may be regarded as typical.

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* This is the third and last article of a series on the Kiev Operation, June 22--September 22, 1941. For an account of the German advance from the south, see "The German Crossing of the Dnieper in the Kremenchug Area (Kiev Operation)," Tactical and Technical Trends, No. 7, p. 40. For an account of the holding attack, see "A German Spearhead in the Kiev Operation," Tactical and Technical Trends, No. 11, p. 47.

The scheme of maneuver was basically the same on both flanks. The outer pincers arm (a Panzer army) drove forward to meet the approaching arm. As the armored spearhead moved on, small task forces were thrown off on the outer flank for security, and on the inner flank to drive the Russians toward troops of the inner pincers arm (composed chiefly of infantry divisions) or against natural obstacles, or to envelop them, and, in any case, to destroy them. Simultaneously with the advance of the armored pincers arm, infantry armies broke through to form the inner pincers and devoted themselves primarily to the annihilation of pockets of troops cut off by the outer Panzer pincers arms. To sum up, between the jaws of the closing pincers--in this case two pairs, an outer and an inner--the enemy is crushed. Or, in the other figure of speech, when the wedges meet, the trap is closed and the enemy is exposed tc total annihilation.

TWO "MOSCOW" ARMIES TURN TO THE SOUTH

The southern flank of von Bock's armies extended from the apex of his advance at Roslavl through Rogachev to the Pripet Marshes. On the eastern end of this long flank, Guderian's Second Panzer Army faced to the south and von Weich's Second Army which had advanced in the rear of Guderian's forces, also faced south on the western end of this flank. The mission of both armies was to drive southward, capture the city of Gomel, trap the Russian forces in that area, and seize bridgeheads across the Desna. The Second Panzer Army was to protect the east flank of the southward moving forces from Russian counterattack. The Second Army was to establish contact across the east end of the Pripet Marshes with von Reichenau's Sixth Army, the most northern army of von Rundstedt's South Group of Armies. The German advance was in general over thickly wooded and marshy terrain. Prior to August 12, the Germans were advancing on the entire Russian front.

THE EASTERN ARM OF THE DOUBLE PINCERS IN THE NORTH

At the beginning of the Kiev Operation, the Second Panzer Army was in the vicinity of Roslavl, a railroad junction on the old Post Road which led south from Smolensk. Its main body apparently advanced south from Roslavl, over the only motor road leading in that direction. Soon after the advance in the new direction began, another element moved southwest, probably with the double purpose of cutting Russian supply lines and shielding more closely the Second Army's left flank. Concerning this advance, there are no available details from Russian sources, but German claims, that the Second Panzer Army rolled back the Russians by a flanking movement to the west before reaching the Gomel-Bryansk railroad, would indicate that the Panzer elements left the south road at Mglin and pushed toward Gomel. The Panzer elements which occupied Chernigov (see p. 53) probably left the Post Road further south at Starodub, but some or all of them may have left the Post Road at Mglin and may have turned south from the Mglin-Gomel road.

The Germans state that Unecha was bitterly contested. No further details are available, except that the Second Panzer Army captured the junction and pushed on to the south. Another German source states that on August 17, there was a tank battle about 130 kilometers (80 miles) south of Roslavl. This was probably the fight for the Unecha junction.

Unlike the road followed by the Second Army from Mogilev to Gomel and thence to Kiev, the Second Panzer Army's road via Unecha to Novgorod Syeversk was not a first-class road, and the available German accounts of the fighting deal in large part with bad road conditions brought about by heavy rains. According to a German source, the vehicles literally had to grind their way through deep mud. The ground was so soft, according to this source, that log roads constructed by the Germans were pressed far into the mud and rendered almost useless by the weight of the supply elements of the German columns. Since the season was summer, it appears that the drying-out of roads was rapid; in any event, Novgorod Syeversk on the Desna was reached. Here bridgeheads were at once established south of the Desna, and the Second Panzer Army was rapidly reorganized and made ready for its part in the Kiev encirclement.

THE WESTERN ARM

At the time of its right turn to the south, the Second Army under von Weichs was apparently concentrated about 100 miles west of Roslavl in the Mogilev-Bobruisk area. A part of this army drove south toward Gomel over a first-class road paralleling and east of the Dnieper. As in the case of the advance of the Second Panzer Army, no details are available concerning this drive to the south.

According to German sources, a flank attack was launched on Gomel by troops which advanced via Jlobin (in some accounts south of Jlobin) and struggled through the Pripet Marshes. Because of the difficult terrain and lack of roads, these troops, however, were probably a relatively small part of the Second Army. No road (according to available maps) leads directly from the Bobruisk area to Gomel. Even the roundabout routes were over poor roads. The road from Rogachev to Jlobin was worse than second-class; no road led all the way from Jlobin to Gorval; and the road from Gorbal to Gomel was second-class or worse. Thus German troops, by whatever route they approached Gomel from the west, faced bad road conditions.

The Second Army encircled and destroyed pockets of Russians at Rogachev and Jlobin and soon struck at Gomel. Despite a strong Russian counterattack, the maneuver, which was apparently an envelopment, was completely successful. The defenders were trapped and the city fell on August 19. According to a German source, infantry, artillery, and engineers had all played major roles; prisoners numbered 84,000; 144 tanks, 949 guns, 38 airplanes, and 2 armored trains were captured.

It appears that von Reichenau's final campaign for seizing the Brest Litovsk-Kiev railroad was not begun until after the success of the Second Army's drive was indicated. Those Russians on the railroad who could not get back to Kiev tried to escape through the marshes and across the Dnieper to Chernigov, but elements of the Second Panzer Army, which presumably had moved over the Starodub-Chernigov road, were already in that city, and the retreating Russians were trapped. Since Chernigov dominated several routes to the east, its loss was a serious blow to the Russians.

PREPARATIONS ARE COMPLETE

By August 21, the Germans held all territory north of the Desna, and both of the northern pincers arms were ready for the final phase of the operation, the advance southward below the Desna into the Russian-held Kiev salient.

While the Second Army and the Second Panzer Army were crossing the Desna into their newly established bridgeheads, other related events had been occurring. Northwest of Kiev, the holding forces of von Reichenau drew nearer to the city after the defeat of the Russians along the Brest Litovsk-Kiev railroad. Von Reichenau's forces had also approached nearer to Kiev on his south flank and, though unsuccessful in an apparent effort at taking that city, had developed strong bunker lines and other defenses behind which troops had been brought up for the Kiev holding attack. This attack, coordinated with the operations south of the Desna, was now launched. Simultaneously in the south, von Rundstedt's South Group of armies had on August 31 thrown a bridge across the Dnieper River below Kiev at Kremenchug, and had effected crossings at other places. The troops of von Kleist's First Panzer Army became the outer pincers arm and the troops of von Stuelpnegel's Seventeenth Army became the inner pincers arm of the envelopment from the south.

THE SECOND ARMY CROSSES THE DESNA

No details are available in regard to the advance south of the Desna by the German Second Army, but the road-net and the general tactical situation would indicate that some elements drove south by Kozelets toward Kiev and that others, further east, drove toward Priluki. Each of these roads was an admirable route for the Kessel part of the wedge-and-trap (Keil and Kessel) maneuver. The road via Kozelets for miles commanded the double-track Kiev-Moscow railroad, and the junction at Brovari commanded every highway available for a withdrawal from Kiev. The road via Priluki at and south of Piryatin likewise intersected important Russian roads and railroads, and continued southeast of Lubni (see below).

THE SECOND PANZER ARMY CROSSES THE DESNA

The Second Panzer Army crossed the Desna just beyond Novgorod Syeversk, the first large town inside the northern boundary of the Ukraine. The Desna, which is some 655 miles long, is the largest tributary of the Dnieper.

The river was defended by strong and extensive fortifications along the eastern and southern banks. German sources state that the bunker walls here consisted of two timbers, each 12 inches thick, with an intervening space of 24 inches filled with sand.

As the Germans advanced, the service of engineers was constantly needed. The Germans had to repair a damaged bridge across the Desna and had to build a ponton bridge over the Seim.

At Konotop where the railroad from Kiev to Moscow intersected a north-south highway, the Russians resisted stubbornly, for they realized that the loss of Konotop would not only prevent supplies from being sent to the retreating armies in the trap, but would imperil the retreat of these armies from the trap. However, the Germans captured the city and the outer armored pincers arm was free to advance the remainder of the distance across the northern half of the Kiev salient. As the advance elements moved forward, other troops came up and held the town and protected the rear.

After the Germans took Konotop, the Second Panzer Army drove straight across country toward Romni. A very heavy rain began to fall as the leading battalion entered the town. It rained continuously on September 11 and 12, and German armored vehicles had great difficulty moving in the mud. Large towing-machines and caterpillar tractors were the only vehicles which could pull out the heavy trucks loaded with fuel, ammunition, and supplies. At times the supply elements were completely out of contact with the combat elements. Even the engineers, according to the Germans, were powerless because of the mud. Drivers used tree trunks and branches, wire rolls, and wooden fences to make wheels take hold, and yard by yard the vehicles moved forward.

The bad weather did not last long, and the main body of Germans reached Romni. German tanks drove through the town and across the first bridge beyond without much trouble. However, the Russians opened fire on the unarmored vehicles following in the rear. A second bridge, at the exit of the town, was stubbornly defended by snipers with automatic weapons in cleverly built positions along the steep embankment on the far side of the river. German engineers and riflemen finally drove the Russians out of the emplacements by going around and attacking from the rear. Then the armored spearhead moved on towards Lokhvitsa, farther to the south.

As the Germans moved south they met, with ever greater frequency, Russian troops attempting to flee from the trap, the closing of which was by now obvious to the Russian commander. Some Russians escaped, but the rapid closing of the trap caught most of the Kiev defenders inside.

THE NORTHERN WEDGE MEETS THE SOUTHERN

As the Germans approached Lokhvitsa, they captured three bridges but encountered resistance. The Soviet forces made a counterattack supported by antiaircraft guns using direct fire. Some tanks and a truck with quadruple-

mounted machine guns attempted to take the bridges from the Germans. These Russian vehicles approached to within 300 yards and then their attack slowed down in the face of the fire of German antitank guns and howitzers. Since they drove back but did not destroy the attacking Russians, the Germans protected their positions by laying mine fields. On Friday, September 12, some of the German armored vehicles entered the town, and on Saturday the 13th, they pushed on to villages only some 25 miles from the northward-moving tanks of the First Panzer Army of General von Kleist.

The closing of the armored pincers was to take place without delay. On Sunday, September 14, a strong reconnaissance element of the Mark Brandenburg Panzer Division from the Berlin area, cut the Kiev-Kharkov railroad, over which supplies were brought for the Soviet armies in this area. This Panzer division continued to advance southward. By this time the advance elements of a Panzer division from the Rundstedt South Group of Armies had penetrated as far north as Lubin.

As the northern arm moved south over the last miles, it encountered Russian trucks and horse-drawn wagons. These were dispersed by fire and the advance continued. A German reconnaissance plane was overhead. Radio messages were constant. Shortly after 1430, the valley of the Sula was entered. River crossings were necessary, and dangerous highway defenses were encountered, but the heights at Luka were reached at 1620. Two hours later the advance elements reached a demolished bridge on a small tributary of the Sula. Across the stream was an armored reconnaissance detachment of a Vienna regiment belonging to the First Panzer Army of the South Group of Armies. The armored pincers arms from the north had met the one from the south. The advance continued on to Lubni.

While the advance continued south from Lokhvitsa to Lubni, a spearhead from the South Group of Armies were being driven north from Mirgorod along the highway, to Lokhvitsa. No difficulites were encountered, since elements of the Mark Brandenburg Division were already waiting for the advancing elements of the Vienna Division. The wedge operation was completed.

THE KESSEL

According to German practice, the two outer encircling Panzer arms threw out on their outer flanks enough tank elements to prevent a breakthrough by any Russian forces to the east. Troops of the inner pincers arms were enabled to devote themselves exclusively to entrapping and capturing the Russians. The Second Army elements referred to above as moving via Kozelets and Priluki had the help of Von Stuelpnegel's Seventeenth Army which moved up from Kremenchug. Crossing the Dnieper at Kiev, von Reichenau's Sixth Army also attacked the Russians who were attempting a withdrawal. Hemmed in on all sides, the Russians were soon defeated. The German mopping-up maneuvers apparently consisted chiefly in minor wedge and trap operations in any area where German forces could either encircle a body of Russians or pin it against a natural obstacle. The Germans pronounced the Kiev operation officially

concluded on September 22, and claimed that 665,000 Russians, including four or five of Budenny's armies, were captured.

The figure, however, seems excessively large unless (as is German custom) all able-bodied men in the district were counted as prisoners of war. In fact a German account intimates that women as well as men were counted in the total: "female riflemen....refused to be regarded as civilians. They were soldiers and could shoot machine guns and pistols like a man. So they had to march with the male prisoners."

CONCLUSIONS

Several conclusions can be drawn from the Kiev encirclement:

(1) A large encirclement operation is more than a simple advance by armored troops. It generally begins by an initial breakthrough toward some definite point, the occupation of which will threaten a vital line of communications.

(2) Secondary pincers movements may be expected at any point as the operation develops.

(3) Emergencies must be met by subordinate commanders on the spot by intelligent action in harmony with the general plan.

(4) Superiority in the air, superior mobility on the ground, and smoothly functioning radio communications are absolutely essential.

(5) Supply and vehicle maintenance agencies must be prepared to cope with unusual and often precarious situations. Security must be carefully planned and vigorously executed.

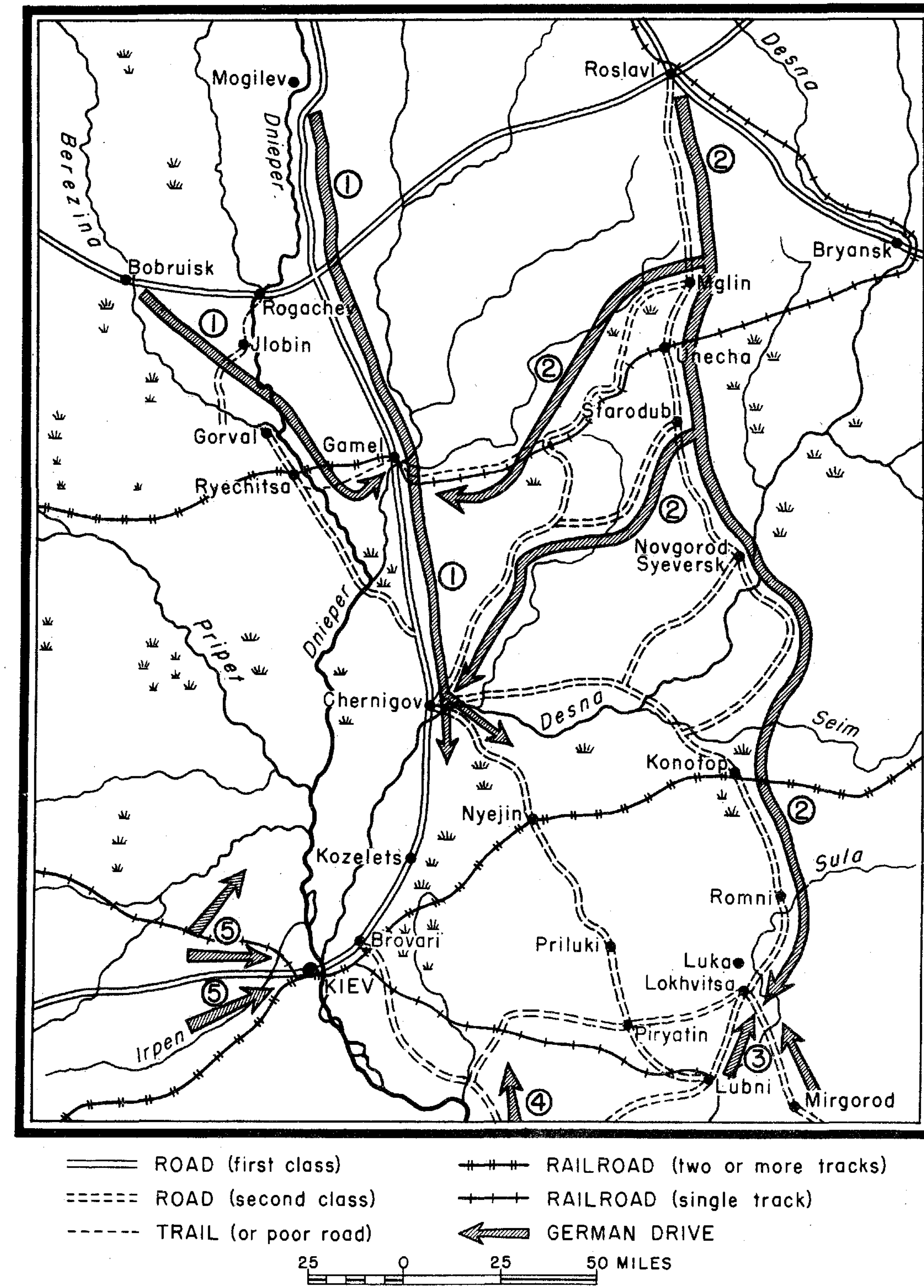
(6) From German accounts it would appear that Panzer forces often operate with calculated recklessness and without flank protection. These forces in fact operate ahead of the main body, but a study of an operation will usually reveal that the exposed flank of the rapidly moving units is protected by natural obstacles or by adequate forces assigned to this mission, or by both.

(7) An important principle of the successful encirclement is the application of greatly superior combat power at decisive points. The German plan was to immobilize, surround, and annihilate units before they could be thrown into action.

(8) The fundamental steps in the German plan of operations may be summed up as follows: first, to locate the enemy through reconnaissance and espionage; second, to disrupt enemy communications by air power; third, to concentrate decisively superior strength at vital points, with full use of secrecy, deception, and speed of execution; fourth, to encircle and annihilate the hostile forces.

MAP LEGEND

1. Approximate routes of the Second Army of von Weichs.
2. Approximate routes of the Second Panzer Army of Guderian.
3. Spearheads of the First Panzer Army of von Kleist.
4. Spearhead of the Seventeenth Army of von Stuelpnegel.
5. The holding attack of the Sixth Army of von Reichenau.



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SECTION I

AIR

1. GERMAN DECOY TARGETS

Systematic attention to detail has always been a basic concept of German military theory, and the present war has proved no exception in this respect.

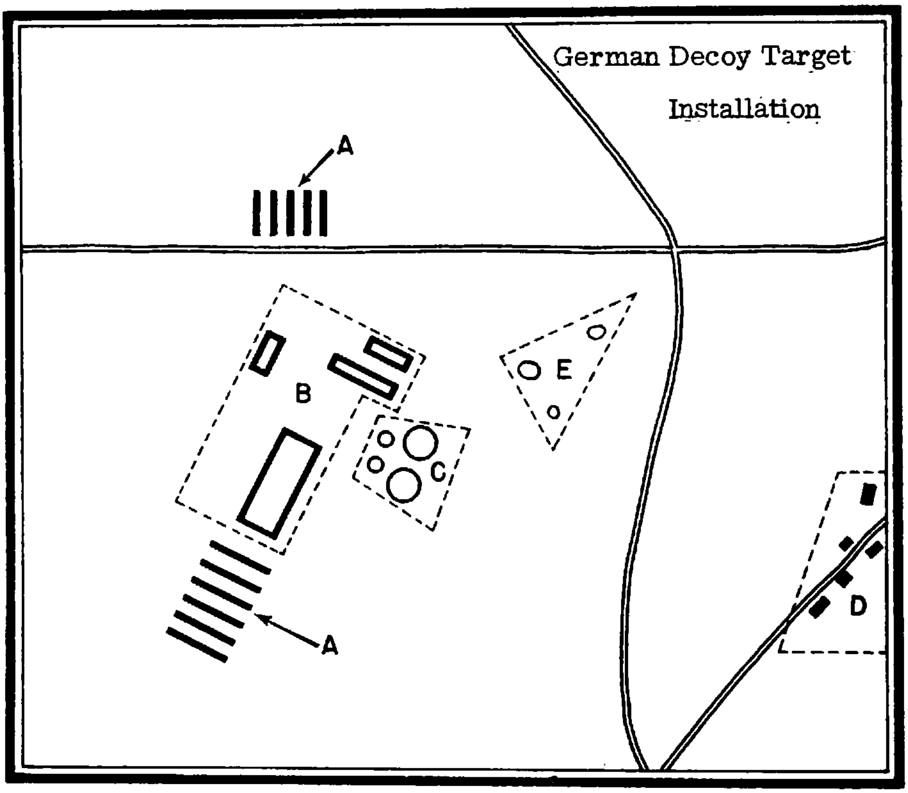
The original German plans for the conquest of Europe apparently hinged on the striking power of the Luftwaffe, which believed itself to be invincible both in offense and defense. The Polish, Norwegian, and French campaigns supported this assumption and it was not until the Battle of Britain that it was seriously challenged. Goering had laid great emphasis on the Luftwaffe's ability to defend German cities from enemy air attack, and the possibility of such an attack was not really contemplated until after the failure to destroy the RAF over England. This miscalculation as to the strength and fighting power of the RAF forced a revision of German theories as to their own air capabilities, and the unexpected requirements of the Russian invasion afforded the British the welcome opportunity to create a powerful offensive air force. When the Luftwaffe found itself fully occupied in Russia, and consequently unable to supply the necessary aircraft for adequate defense against air attacks from the west, the road was clear for the RAF to organize bombing operations against German cities. Ground defense against large-scale bombing attacks thus became a German necessity, and among the methods developed was the decoy target.

Although the object of a decoy target complements that of camouflage, the two differ materially. Camouflage endeavors to hide the actual target - at least from visual reconnaissance - while a decoy target is intended to be used at night to divert bombing attacks from the real objective. Elaborate decoy systems cover most of the large cities and industrial areas in Germany and, to a lesser extent, those in the occupied countries.

The German decoys consist of specially built units of varying design, usually in the form of either large rectangles (150 by 300 feet) or circles similar in size and appearance to oil tanks, all filled with some combustible material, and erected at a distance, usually 2 to 5 miles from the town or target to be protected. At night, when a raid is expected, these units or "fire sites" are ignited and resemble large fires in built-up areas, burning buildings, or oil tanks. They stand out against the dark landscape and invite investigation by the approaching bombers endeavoring to locate the target. With the increased use of incendiaries, bombing crews tend to become "fire minded" and to bomb fires in the estimated target area. This leads to more fires and further attacks on the supposed objective, to the exclusion of the real target. The effectiveness of such decoys is further increased by foggy or cloudy weather, which obscures their real identity and prevents proper recognition of ground features. Once a mistake has been made, limitations of fuel and bomb loads make effective corrections of target errors difficult if not impossible.

A typical decoy installation protecting an important nitrogen and cyanamide plant is shown in the following sketch. It was situated 4 1/2 miles away from the parent target, the layout of which it resembled to some degree.

The two small and two large white circles painted on the ground (C) represent oil tanks. The four walled rectangles (B) are fire sites and, when in action, would represent blazing factory buildings. The two lines of parallel walls (A) are probably intended to indicate outlines of factories. Three bomb craters are seen at (E), indicating some successful deception. There is a collection of sheds at D which probably houses the personnel and controls, operating the decoy.



Another elaborate installation simulates a synthetic oil refinery. A number of tanks painted on the ground are surrounded by dummy protective walls. In the immediate vicinity are several rectangular fire sites. A pipe line is represented by a dark line painted over fields leading down to the shore, where there is a dummy wharf with two lighters in the mud alongside.

The present trend of "fire sites" is to have them cover much larger areas than was originally the case. Instead of rectangles, there are irregular block formations or bays cut into diagonally opposed corners with dimensions as much as 630 by 350 feet. These are filled with combustible material which when afire gives the appearance of entire blocks of burning buildings. It is often noted

that gutted areas in towns are shaped in this manner, with the streets forming fire breaks. A different type consists of a large number of low, sloping sheds, roofed,but without walls. Their total destruction, when bombed, suggests a fierce fire and possibly indicates treatment of the surface with some inflammable liquid.

Numerous examples of the success of decoy operations have been noted. In one instance, a decoy 4 miles from the actual target was clearly identified by photographs and yet was later largely destroyed after four night-bombing attacks. Subsequent reconnaissance disclosed a large number of bomb craters in the vicinity. In another case, a large and effective decoy covering an area 3 miles by 1 1/2 miles and far removed (20 miles) from the target, a large industrial town, received most of the attack,with eight aircraft photographing the actual bombing.

Decoys are not so useful in coastal areas, as the real targets are more easily located. However, five decoys within a 5-mile radius of a seaport diverted over one-third of a large number of bombers from the objective.

Decoys often take the form of fake reproductions of vital installations or areas. This is particularly true of airdromes and landing strips, 1 decoy airdrome on an island collecting 51 new bomb craters within 2 months. Sometimes the dummy is combined with a "fire site." A certain German aircraft factory has such a combination located a mile-and-a-quarter away, the dummy assembly shops being identical in size and angle of direction with the original, and having a rectangular fire site between two of them.

The tendency of night bombers to attack fires often leads to action against "self-creating decoys," i.e. genuine fires off the target, caused by forced jettisoning of bombs or by incendiaries dropped after erroneous identification. In one attack, the first wave of aircraft bombed a town 9 1/2 miles off the target and set it afire. Subsequent groups all attacked the fires,with the result that the real objective received little or no damage.

In favorable weather affording good identification, decoys are ineffective and may actually be useful in locating the target when their distance and bearing from it can be accurately estimated.

2. JAPANESE "SLICK" NAVIGATION OVER WATER

On a return flight to their carrier operating in the Pacific,U.S. Navy pilots noticed slicks on the water between the Japanese and U.S. forces. One pilot zoomed on one of the slicks. He discovered that it was an aluminum slick. Four of these slicks were observed. They were about 30 miles apart. The first one noticed was about 50 miles from the Japanese forces and the fourth one about 100 miles from our forces. The slicks were about 20 feet wide and 100 feet long. It has been suggested that these slicks were set down by the enemy to

aid their pilots in their navigation to and/or from our forces on their attack missions.

3. JAPANESE USE OF U.S. PLANES

There is some evidence that the Japanese may be using captured U.S. planes with U.S. markings for reconnaissance purposes.

On two distinct occasions an unidentified U.S. Navy PBY has been seen hovering around the edge of a U.S. Navy task force for a good part of the day. The Air Officer of a U.S. carrier believes this PBY may have been captured by the Japanese and is being used by them for reconnaissance. On an earlier occasion, a U.S. plane tried to identify the personnel of a PBY and reported that the personnel turned their faces away. Two other pilots reported that a PBY gave them the incorrect signal but showed the proper lights and a third pilot said that a PBY gave him the correct signal but showed the wrong lights. Bombing pilots reported similar incidents where a PBY circled for a long time before giving recognition signals.

4. GERMAN RAILWAY FLAK

Protection of troop and freight trains is determined by such weapon disposal as best assures the safe arrival of the train with the minimum of losses. The following article, reproduced by permission of the British Air Ministry, contains information which supplements that reported in Tactical and Technical Trends, No. 5, p. 7.

a. Equipment for Defense of Trains

The normal Flak gun for the defense of trains is the 20-mm; machine guns are also used. It is possible that the 37-mm gun may sometimes be used, though this is not known for certain. The accompanying sketch shows a 20-mm railway Flak detachment.

An open freight car is the type commonly used for the 20-mm gun according to the German manual. The gun can be accommodated at one end, and the crew under a removable roof at the other; alternate positions are provided at either end of the car so that the gun position and crew shelter can be reversed, if necessary.

The muzzle-brake is removed from the 20-mm gun to reduce the length of the barrel. Safety fences on all four sides of the gun insure that it is not fired below the safety angle. These measures make it impossible for the gun to strike obstructions such as tunnels, signal posts, or other trains. Other safety measures include the posting of look-outs to prevent firing which might damage telegraph wires, signal posts, tunnels, or other obstructions, and a complete prohibition of firing on electrified lines with overhead cables.

Photographic evidence suggests that, in practice, converted passenger coaches and roofed freight cars with part of the roof removed are often used instead of freight cars, - a measure probably dictated by the need to economize in specially constructed cars.

b. Employment

It is understood that the allotment of Flak cars per train is as follows:

(1) Three cars mounted with machine guns placed a quarter, a half, and three-quarters of the way along the train.

(2) Three cars carrying 20-mm light Flak guns: one in the middle of the train, one at the rear, and one immediately behind the locomotive. The gun behind the locomotive is not manned, being a spare to permit reversing the train without shunting the guns.

(3) On especially important trains an additional 20-mm gun is carried on a car in front of the locomotive.

In practice the allotment of Flak cars varies considerably, and it is probable that the full allotment is rarely allowed. A recent report stated that on French railroads two Flak cars, instead of the usual allotment of one, were to be run at the rear of all trains in use by the armed forces; on the other hand, in many cases an allotment of as little as one gun to a train is made.

Examples of trains (believed to be military) photographed in France are as follows:

(1) Engine, 5 passenger coaches, 5 box-cars, Flak car, 12 box-cars, 5 flat cars, 3 box-cars, 8 flat cars;

(2) Engine, 4 passenger coaches, 14 flat cars, Flak car, 25 box-cars;

(3) Engine, 23 flat cars, 5 box-cars, Flak car, 3 passenger coaches, 2 box-cars, 16 flat cars, 1 open car, 2 flat cars, and 1 box-car.

It is of interest that, in most cases in these examples, the Flak car is preceded or followed by box-cars, which must presumably hinder somewhat the field of fire.

On the move the guns, continuously manned, are allotted 180° priority arcs as follows:

(1) Forward--the front MG and center 20-mm guns;

(2) Rearward--the center and rear MG's and the rear 20-mm gun;

(3) Forward--the 20-mm gun in front of the locomotive (when carried).

When the train is stopped, the guns may be moved from the cars and deployed on the ground so as to give a better field of fire. The decision to do this naturally depends on the probable length of the halt.

c. Protection of Ground Areas and Lines of Communication

In many parts of Germany and also, it is believed, elsewhere (especially in Russia), mobile heavy and light Flak units are employed with guns on railway mounts. They may be equipped with any of the following calibers: 20-mm (single or four-barrelled), 37-mm, 75-mm, probably 88-mm, 105-mm, and possibly 150-mm. These units move from place to place in special Flak trains, with their own living and kitchen accommodations. The heavy guns are not fired on the move, though no doubt one or two of the light guns are manned for defense of the train. On arrival at their destination the trains are broken up, and the guns and equipment sited on sidings.

Considerable reliance is placed by the Germans on these railway Flak units as a means of providing rapid reinforcement to threatened areas. Air

GERMAN 20-MM ANTIAIRCRAFT RAILWAY GUN

reconnaissance has shown that frequently railway Flak has been moved to ground defense areas after a heavy RAF attack, in the expectation of further attacks on subsequent nights. Instances have also been reported of the employment of railway Flak at objectives where, for reasons of expediency, no permanent Flak protection is provided.

Apart from the reinforcement of ground defense areas, railway Flak units are used, especially in theaters of active operations, for mobile protection of railway communications. For this purpose light guns are apparently considered of most value, presumably since stations, junctions, loading bays, and sidings are particularly vulnerable to low-flying attack.

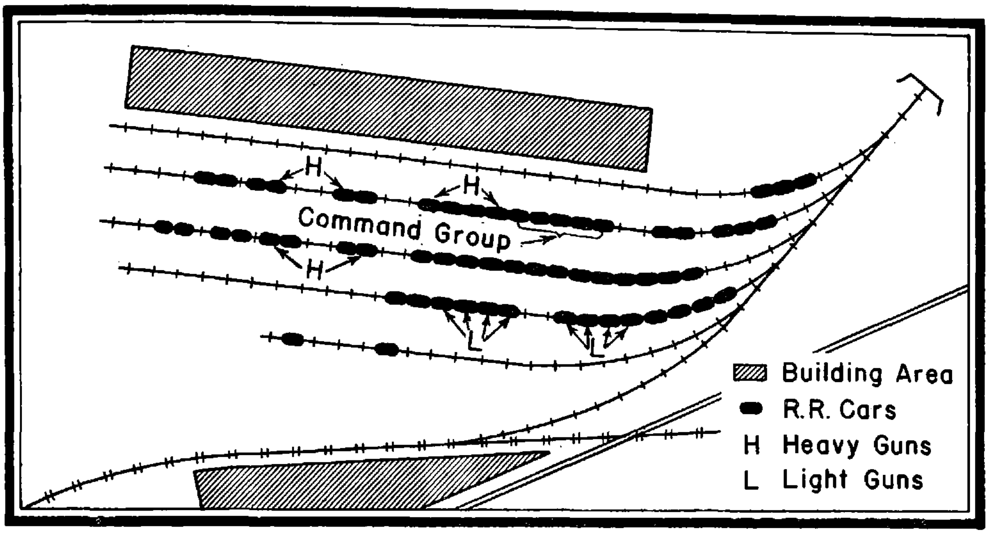
d. Composition

Heavy railway Flak units identified from air photographs normally consist of four heavy Flak cars, two light Flak cars, and a command group. The command group comprises cars of a special type, often four in number, one of which carries the Kommandogerät (director and rangefinder) and a second, in some cases, equipment for remote fire control. The purpose of the remaining two cars is not entirely clear; one is possibly a plotting and control unit for the use of the gun position officer (battery executive) and the other may in some instances carry a searchlight. In many instances the command group is confined to two cars. These may correspond with the first two cars of the four-car command group, though it is not unlikely that they may be associated with units equipped with the lighter auxiliary fire-control instruments only, one car carrying the auxiliary director and the other the rangefinder. In addition to the operational cars there are several coaches which provide accommodation for the personnel.

e. Siting

So far as the limitations imposed by the railway tracks permit, an effort is made to lay out the gun positions in the normal manner. The heavy Flak cars are usually sited on the unoccupied tracks of a siding at the corners of a rectangle, the long sides of which generally vary from about 40 to 80 yards. The command group is sited at one end of the position, some 100 to 300 yards distant, and the light Flak cars generally at either end of the position. A position of this type is shown in the sketch on the following page.

When only a single siding is available, the heavy Flak cars are sited along it at intervals of 40 to 50 yards, the remainder of the position being similar to the type described above.



f. Construction

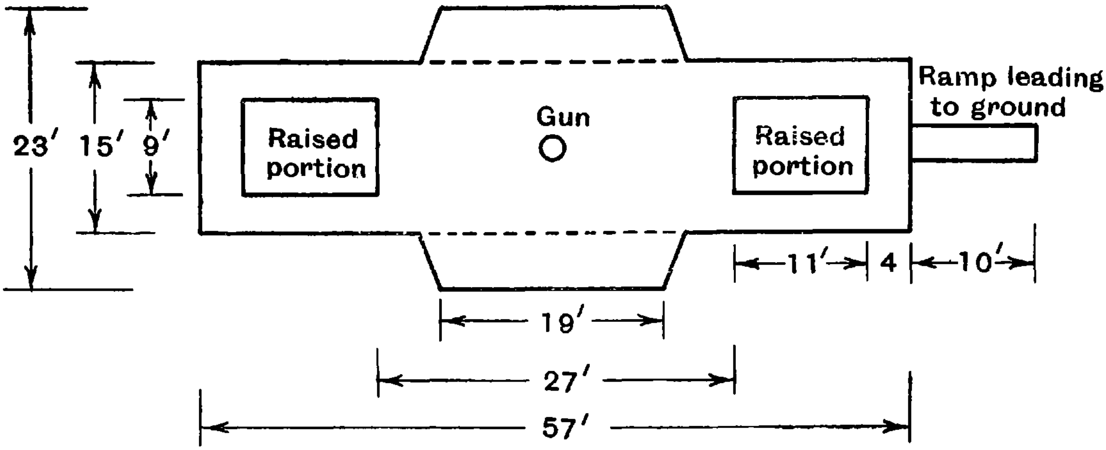
There appear to be two main types of heavy and one main type of light Flak cars. Their dimensions and construction are shown in the accompanying sketches; since the measurements are obtained solely from photographic interpretation, they are subject to a margin of error of 10 to 15 percent.

The extension to the center part of the broad-type heavy Flak car (outside the dotted lines in the sketch) is clearly shown by photographic evidence to be a folding flap. It is highly probable that the platform surrounding the raised portions is also capable of being folded or detached when in transit, since the movement of a 15-foot vehicle would be impracticable, except possibly on special sections of a railroad. The raised portions are about 2 to 3 feet above floor level; it is of interest that, whereas they are surrounded by a platform in the broad-type car, they extend the whole width of the narrow type.

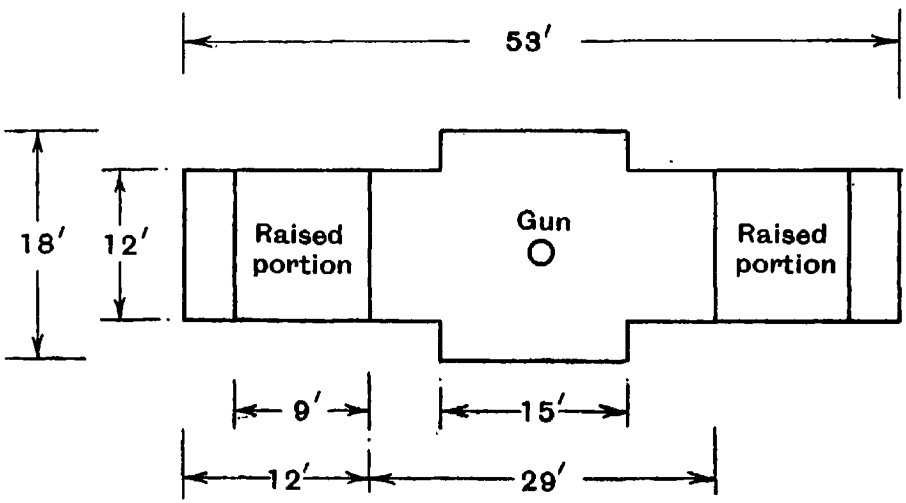
g. Organization

Railway Flak units are organized into regiments, battalions, and batteries; the precise composition of the units is not known. It is believed that the regimental organization forms a pool from which units may be drawn as the necessity arises, either for mobile defense or for train protection. The unit most frequently met with is the battery, which in mobile defense probably moves and operates as a unit; in the case of train protection, the battery headquarters presumably administers detachments allocated to different trains. Although railway Flak units are part of the German Air Force and are administered through

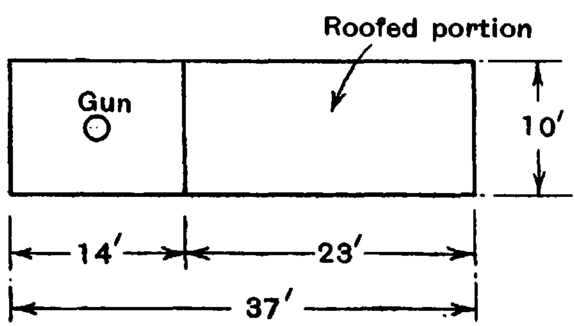
Heavy Flak Car (broad type)



Heavy Flak Car (narrow type)



Light Flak Car



the usual GAF channels, it is probable that train protection detachments are operationally subordinate to the transport authorities; there is some evidence that guns provided for the protection of military trains may in certain circumstances be manned by army personnel.

ANTITANK

5. PENETRATION PERFORMANCE OF ANTITANK GUNS

The following report contains the penetration performance of German antitank guns. The figures, in general, are based on performance trials carried out in England. Where no trials have been fired, the table is marked estimated. All figures given are as a result of trials on homogeneous armor.

20-mm AA/AT Guns

AP Shell

Muzzle velocity	2,625 f/s
Weight of projectile	.327 lb

Range (yds)	Thickness of armor in mm 30°	Normal
100	31 (1.22 in)	48 (1.89 in)
200	29 (1.14 in)	44 (1.73 in)
300	27 (1.06 in)	41 (1.61 in)
400	25 (.98 in)	38 (1.50 in)

AP 40 Shot

Muzzle velocity	3,270 f/s
Weight of projectile	.223 lb

Range (yds)	Thickness of armor in mm 30°	Normal
100	49 (1.93 in)	57 (2.24 in)
200	45 (1.77 in)	52 (2.05 in)
300	41 (1.61 in)	48 (1.89 in)
400	37 (1.46 in)	43 (1.69 in)

28-mm Tapered Bore AT Gun Model 41

Muzzle velocity	4,580 f/s
Weight of projectile	.287 lb

Range (yds)	Thickness of armor in mm 30°	Normal
100	69 (2.72 in)	84 (3.31 in)
200	63 (2.48 in)	77 (3.03 in)
300	57 (2.24 in)	70 (2.76 in)
400	53 (2.09 in)	65 (2.56 in)

37-mm AT Gun

AP Shell

Muzzle velocity	2,500 f/s
Weight of projectile	1.68 lbs

Range (yds)	Thickness of armor in mm 30°	Normal
200	42 (1.65 in)	56 (2.20 in)
400	38 (1.50 in)	51 (2.00 in)
500	36 (1.42 in)	48 (1.89 in)
600	34 (1.34 in)	46 (1.81 in)

AP 40 Shot (Estimated)

Muzzle velocity	3,380 f/s
Weight of projectile	.786 lb

Range (yds)	Thickness of armor in mm 30°	Normal
100	68 (2.68 in)	79 (3.11 in)
200	61 (2.40 in)	72 (2.83 in)
300	55 (2.16 in)	65 (2.56 in)
400	49 (1.93 in)	58 (2.28 in)

42-mm Tapered Bore AT Gun Model 41 (Estimated)

Muzzle velocity	4,600 f/s
Weight of projectile	.796 lb

Range (yds)	Thickness of armor in mm 30°	Normal
200	93 (3.66 in)	115 (4.52 in)
500	77 (3.03 in)	94 (3.70 in)
700	68 (2.67 in)	83 (3.26 in)
1,000	55 (2.17 in)	68 (2.68 in)

47-mm SP AT Gun (Estimated)

AP Shell

Muzzle velocity	3,000 f/s
Weight of projectile	3.68 lb

Range (yds)	Thickness of armor in mm 30°	Normal
300	59 (2.32 in)	76 (2.99 in)
500	55 (2.16 in)	72 (2.83 in)
700	52 (2.04 in)	68 (2.67 in)
1,000	47 (1.85 in)	62 (2.44 in)

50-mm AT Gun

AP Shell

Muzzle velocity	2,700 f/s
Weight of projectile	4.53 lb

Range (yds)	Thickness of armor in mm 30°	Normal
500	65 (2.56 in)	78 (3.07 in)
700	61 (2.40 in)	73 (2.87 in)
1,000	56 (2.20 in)	67 (2.64 in)
1,200	52 (2.04 in)	63 (2.48 in)

76.2-mm AT Gun (Russian)

APCBC Shell

Muzzle velocity	2,200 f/s
Weight of projectile	14.81 lbs

Range (yds)	Thickness of armor in mm (estimated) 30°	Normal
500	79 (3.11 in)	94 (3.70 in)
1,000	70 (2.75 in)	83 (3.26 in)
1,500	61 (2.40 in)	73 (2.87 in)
2,000	53 (2.08 in)	64 (2.52 in)

88-mm Multi-purpose Gun

APCBC Shell

Muzzle velocity	2,750 f/s
Weight of projectile	21 lbs

Range (yds)	Thickness of armor in mm 30°	Normal
500	110 (4.33 in)	129 (5.07 in)
1,000	101 (3.97 in)	119 (4.68 in)
1,500	92 (3.62 in)	110 (4.33 in)
2,000	84 (3.30 in)	100 (3.93 in)

ARTILLERY

6. GERMAN LIGHT-WEIGHT ARTILLERY

It is reported that there are two types of specially constructed light-weight German guns, the L.G.1 and L.G.2 (L.G. being the abbreviation for Leichtes Geschütz or light gun).

L.G.1 still remains rather an unknown quantity. It seems probable that the caliber is 75-mm and there are indications that it is modelled on the lines of the normal 75-mm infantry gun. There is evidence that this weapon is very low and compact, with a very light split trail, exceedingly small wheels, and a small light shield. It is most unlikely that such a gun could achieve a reasonable degree of accuracy except at very close range, and economy in material appears to have been carried to such lengths that the strength, reliability, and life of the weapon must be seriously affected.

L.G. 2 is known to be of 105-mm caliber and has been reported as similar in design to L.G.1. There may also be an L.G.3.

The development of parachute and airborne warfare by the Germans made inevitable the development of special artillery weapons. It may also become necessary to provide antitank guns, built on similar lines, of sufficient velocity and caliber to be effective against modern armor. The probable use of hollow-charge ammunition by the existing light-weight artillery guns is not likely to relieve this requirement, and it is probable that normal types of antitank guns will have to be modified or redesigned if large-scale airborne operations should be contemplated.

CHEMICAL WARFARE

7. CIVIL PROTECTION AGAINST GAS WARFARE IN ENEMY COUNTRIES*

The information below covers the steps taken in Germany, Italy, and Japan for the protection of civilians in the event of gas warfare.

a. Germany

(1) The "Luftabwehrdienst" (Air Protection League) has been responsible for the most thoroughly trained civilian population on the continent. Civil defense services, including antigas measures, are organized on a compulsory basis under control of the police and in nearly all cases are very efficient. The Nazi philosophy of subjugation acts to insure immediate obedience in civil, as well as military, matters.

(2) When an alarm is sounded, civilians are trained to go to gas-proof shelters required in all buildings. Serious consideration has been given the matter of gas-proofing shelters in Germany, and detailed instructions have been prepared and distributed. These shelters include all types, from the massive

*Prepared in the Office of the Chief of Chemical Warfare.

"Luftschutzturme" (air protection towers) holding up to 500 people, and the bell-shaped cement shelters with deep foundations and thick walls, accommodating 250 persons, to individual homes with gas-proofed rooms. Double-door construction with seals, special ventilating plants, and other methods of combatting gas have been adopted, despite the fact that high explosives landing in the immediate vicinity would damage and render ineffective the seals, warp the metal doors, etc. According to reports which filter through from Germany, the past year has seen an accelerated program in gas-proofing private shelters in the larger centers, such as Berlin, Hamburg, Frankfurt, and Bremen, where public shelters have already been made gas-proof.

(3) An adequate organization appears to have been built up to handle civilian defense. Air-raid wardens, fire watchers (or spotters), bomb-removal and decontamination squads are all trained to combat raids on the larger cities. In some of the important industrial centers, the individual citizens have been instructed in dealing with incendiary bombs (and resultant fires) and have performed these tasks during past raids by Allied planes.

(4) As a result of regular bombing raids by Allied aircraft, blackouts are carried out in orderly and organized efficiency.

(5) Regarding gas masks, the picture is slightly obscure. The following information appears, however, to portray the general situation. Early in 1942, the authorities were reported as diligently pushing forward a program whereby every civilian would possess a gas mask, even to the extent of making house-to-house canvasses. Later information disclosed that gas masks were being collected and shipped to the armed forces at the front, together with Czech and French masks, leaving only the civilian defense personnel with masks. This action may have been predicated on the assumption that gas-proofed shelters (noted in (2) above) would obviate the necessity for civilians owning gas masks. However, it is extremely probable that in such vital spots as towns where chemicals and war gases are manufactured and stored, gas masks are possessed by local residents as a precaution against the effects of bombing.

(6) No information is available at this time regarding the use of antigas clothing by civilians, although it is known that a transparent or opaque material called "Cellaplan" has been developed in various colors and is proclaimed to be suitable for raincoats, overalls, etc. If this is a form of cellophane, it may possess good mustard-resisting properties and might conceivably be intended solely for civilian use.

(7) A German training circular for civilian defense suggests the use of "losantin" as a first aid treatment for incendiary burns. As is well known, this preparation in tablet form is a standard issue in the German Army for antigas protection. Certain factories have been reported as issuing "Rhodasopa" (an antigas soap) for use by their employees in protecting against certain vesicants.

b. Italy

The "L'Unione Nazionale per la Protezione Anti-Aeria" (UNPA), corresponding to the Air Protection League of Germany, undertook the task of assisting air defense organizations, disseminating information, and cooperating in the execution of air defense measures. In some cases, especially in the larger cities, good results were obtained, but from prisoners of war it has been learned that smaller towns had practically no air defense organization. Children in particular were trained in raid conduct. Air raid warning sectors were established, wardens appointed, blackouts were held - but apparently interest lagged. However, it may be assumed that certain training has been given the Italian populace.

With respect to gas masks, it is difficult to assess the situation accurately because of a scarcity of information. The latest reports available reveal that only about one million masks have been sold to the public, and the Pirelli company (which has a government franchise to manufacture masks) has about 2 1/2 million unsold. It may be that the latest raids on Naples, Milan, and other centers have stimulated the public's desire to own and carry gas masks. The army and air raid personnel are presumably well equipped.

c. Japan

The Antiaircraft Defense Association, "Kokukiokia," instructs civilians in air raid measures. It is a local, voluntary organization working under government control, educating and training the public. Smaller units known as "Neighbor-Group Air Defense" groups, of about 11 families each, are also organized to combat fires, etc., but until actual raid conditions prevail, no knowledge of their efficiency in training may be expected.

Such information as is available tends to show that the government is thoroughly aware of the vulnerability of the islands. As far back as 1936, air raid shelters were constructed in Tokyo, and others have been built throughout the empire since. While the necessity of gas-proofing these shelters is perfectly obvious, and no doubt regulations were issued to this effect, there is no documentary evidence along these lines.

According to a German broadcast on March 23, 1942, the Japanese government, recognizing the failure of the people to purchase gas masks for their protection, began the distribution of masks throughout the islands, limiting the number to one to a household for training purposes and assessing the costs to the individual. The State bears the cost to the poor.

8. PROTECTION OF HORSES

It is reported that the following antigas equipment is available for the protection of horses in the German Army:

(1) A horse gas mask, with two containers, model 41. This protects horses and mules against all gases affecting the respiratory organs. The life of the container is several hours, depending on the concentration of gas and the nature of the animal's work. The containers can be readily changed.

(2) A pair of horse goggles, model 41, to be worn with the mask to protect the eyes from spray.

(3) A set of hoof covers, model 41, in three sizes, to protect the lower part of the leg on contaminated ground. The front leg covers are shorter than the hind ones.

(4) A supply of horse decontamination material.

All of the above articles are carried in one special carrier.

ENGINEERS

9. GERMAN METHODS OF CROSSING ICE

What follows is believed to be the official views of the German Army on the possibilities and limitations of ice in so far as it affects the passage of military traffic over water obstacles. However, while the views expressed are presumed to embody the lessons learned during the Russo-Finnish war of 1939-40, they do not embody the experience gained by the Germans during the Russian campaigns.

* * *

In general, freezing conditions lessen the value of water as an obstacle and make the terrain more passable; this will tend to weaken the defense and strengthen the attack. On the other hand, ice floes and thin ice considerably increase the difficulty of crossings and necessitate special measures.

a. Roads Across Ice

The following are the loads which can be supported by sheets of solid ice of various thicknesses, lying on water:

Thickness	Load
1 1/2 in.	Single infantrymen
2 in.	Infantry in open order
4 in.	Single horses

Thickness	Load
6 in.	Infantry and horsed cavalry in column of march, with light motor transport
8 in.	Light artillery up to 2 1/2 tons, horse-drawn, and 4-ton wheeled vehicles, maximum axle load 2.7 tons, minimum interval 65 feet
1 ft.	10-ton wheeled vehicles, maximum axle load 7 tons, minimum interval 65 feet
1 ft 2 in	20-ton wheeled vehicles, minimum interval 100 feet

Experiments have shown that a sheet of ice 10 inches thick will carry tracked vehicles up to 16 tons at an interval of 165 feet, moving at a speed of not more than 2 1/2 mph, provided that track slip is avoided.

Ice will carry heavier loads over still water than over streams and rivers. The thickness of the ice may vary over the same stretch of water; if, for instance, warm springs are present the ice will tend to be thinner, or if the river bed is locally swampy it will tend to be thicker or even frozen solid through to the river bed. A layer of snow on the ice diminishes its strength, since the warmer water from the bottom does not cool on rising as readily as in the absence of snow, which tends to insulate the ice from the cold atmosphere. Warm weather (thaw) diminishes the carrying capacity of ice very rapidly, even when the thickness of the ice remains the same, since the ice becomes somewhat porous. The thickness of ice should be determined by boring; at the same time, it should be ascertained whether the ice is lying on water. In doubtful cases loading tests should be carried out. Holes and open patches (found mostly near the banks) should be treated with special care. Changes in water level, particularly associated with dams, must be carefully observed.

To prepare it for traffic, ice should be covered with gravel or sand. On both sides of the roadway over the ice a strip at least 16 feet wide should be kept free of snow, to permit observation of any cracks in the ice. Single cracks running transversely across the roadway do not appreciably diminish its carrying capacity, and can be closed in cold weather by pouring water on them. Heavy cracks running parallel to the track indicate that the carrying capacity of the ice is becoming exhausted.

In sufficiently cold weather, ice can be strengthened or reinforced by the addition of further ice layers. This can be done by the following methods:

(1) Laying and watering of sawn-out blocks of ice;
(2) Addition of water, using low snow dams, the water being allowed to freeze;
(3) Addition of straw, twigs, or reeds which are watered and allowed to freeze.

Strengthening of ice in the above manner can only be carried out if the ice is at least 1 inch thick. The carrying capacity of reinforced ice increases approximately according to the figures already given, but the capacity of the additional "artificial" layer should, in actual practice, be calculated as only half that of natural ice. In strengthening ice the width of the strengthened belt should be at least 2 1/2 times that of the roadway itself. After strengthening, small holes should be drilled in the ice in the neighborhood of the roadway; these will allow the water to seep through and improve the equilibrium of the ice-sheet. The roadway must be carefully marked off, and if in constant use, should be provided with a light surfacing.

Track for the passage of vehicles may be constructed of chess or other planking. Vehicles will normally run at very low speeds on two treadways. Joints of these treadways must be staggered to prevent simultaneous impact on both joints. The load may be spread by timbers placed under the treadway. If boards are placed as cross ties, they should be close enough together to insure that the heaviest loads do not bend the treadway sufficiently to strike the ice.

If ice is artificially strengthened, test loading must be carried out in each instance. The carrying capacity of ice may be diminished by excessively heavy track reinforcement.

For assault infantry crossings, the light assault bridge using planks instead of floats is suitable.

b. Use of Boats in the Presence of Ice

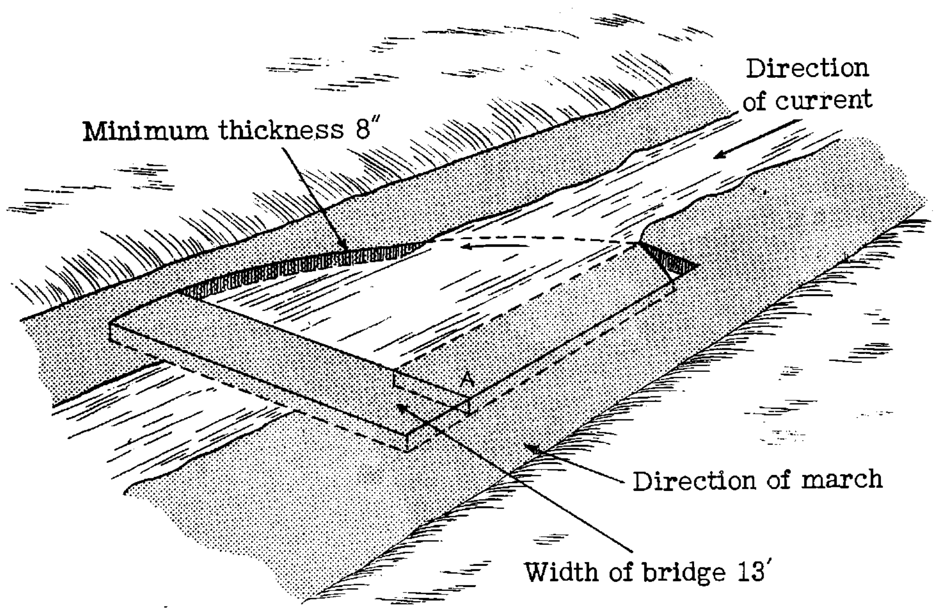
Assault boats, strengthened by thin metal sheeting along the water line, can be used as ice breakers, to cross water covered with ice up to an inch in thickness.

It is possible to negotiate streams filled with ice floes if the current is not too rapid and the floes are of sufficient size and thickness. Pontons must be protected by round timbers or planks secured to the sides with ropes. Floes must be kept off by men standing in the bow and using short boathooks. Large pneumatic boats can be protected in the same way.

c. Ice Bridges

With weather continuously freezing, ice bridges may be constructed to cross short stretches of open water or thin ice. A large block of ice, at least thirteen feet wide, as thick as practicable and several feet longer than the span of water or thin ice, is cut and moved to bridge the gap. This ice bridge may be strengthened according to the methods previously described.

In slowly moving water, it may be convenient to cut the block of ice adjacent to the bridge site and parallel to the bank (see sketch below). After removing the other ice on a ninety-degree arc, it is possible to pivot the block of ice about point A (see sketch) and use the current to swing it into place. Notches cut in the ice on the two sides of the bridge site will hold the block in place.



GERMAN METHOD OF CONSTRUCTING AN ICE BRIDGE

d. Bridging in the Presence of Ice

In general, ice bridges should be replaced as soon as possible by regular bridges. Fixed supports are preferable to floating supports for this purpose. Long spans diminish the danger to the bridge on the breaking up of the ice. Piles should be shod with metal, and some form of ice breaker should be used. Floating supports must be capable of submerging when the bridge is loaded, and should be kept free from ice. Light boats and pontons will be crushed by thick ice, even in still water. For streams where the flow of ice is heavy and those in which the danger of break-up is great, bridges with floating supports cannot be used.

Construction of bridges in the presence of ice floes is difficult, and unforeseen incidents are of such frequent occurrence that definite figures for the time required cannot be laid down. Improvised bridges on floating supports can only be erected when floes are small and the density not too great; under these conditions the floes must be continually pushed away from the supports and allowed to pass under the finished bridge. With larger floes a bridge can only be built if the ice can be broken up at a sufficient distance upstream.

Anchor cables are apt to wear through after a short time; they should accordingly be preserved by being enclosed in three-sided wooden casings, about 10 feet in length, which keep the lines from direct contact with drifting ice. Wire ropes are especially suitable for use as anchor cables under these conditions. Rafts used for pile-driving must be protected from drift-ice by metal boats or floats anchored upstream.

When working on ice, it may be necessary to rope pairs or groups of men together for safety.

A party on guard upstream should be amply provided with explosives and fuzes for the destruction of ice.

10. GERMAN MINE DETECTOR ROD

The full name of this device is the Minensuchstab (Sucheisen n.A.) 39, literally "mine-searching rod (searching iron, new type)"--generally called MS 39. It is made of two lengths of light metal tubing, one of which, the "vibrating tube," has a hardened-steel point, while the other forms an extension piece to be added when the rod is used from an upright position. The total weight of the rod is approximately 1 pound, and that of the vibration tube and point about 10 1/2 ounces. The vibrating tube is connected to the extension tube by means of a bayonet joint. When packed for transport, the vibration tube and point are inserted into the extension tube point first.

A German pamphlet describing the MS 39 gives the following instructions for its use. The rod is to be held lightly between fingers and thumb, and inserted vertically into the ground. Should resistance be encountered, the point is to be lifted approximately four inches and dropped. A skilled operator can tell the nature of the object in contact from its "feel," and from the sound emitted by the vibrating tube. Thus it is stated that the point will "stick" in wood, and the vibrating tube will emit a dull note which will be practically inaudible if the wood is growing. The rod will rebound from metal objects and give out a high note, while stones produce a high, almost shrill note, and cause the rod to rebound sharply.

11. GERMAN NOTES ON STREET FIGHTING

In view of the importance of the strong internal defense of towns under siege as demonstrated in Russia, the following notes on street fighting has particular significance at this time. The notes which follow are taken from a German handbook dated January 1939.

It is of interest to compare this article on German methods with British notes on street fighting contained in the next article.

a. Attack

(1) Towns will be surrounded, and water power and gas cut off.

(2) The enemy-occupied area will be attacked with the object of dividing it. These areas will then be isolated into as many pockets as possible, so as to deny the enemy freedom of movement.

(3) Attacking parties should move in the same direction along parallel streets. Parties moving in opposite directions create confusion and cause friendly troops to fire on each other.

(4) High buildings with commanding positions will be taken whenever possible.

(5) Flanking attacks should not be attempted.

(6) Troops should advance along both sides of the street, keeping close to the houses.

(7) Parties should also attack across roofs, and from house to house.

(8) In the streets, men will be detailed to watch roofs, windows, crossings, etc., on the side of the street opposite them.

(9) Single light machine guns can be moved along streets to open direct fire on points of resistance. To destroy large buildings, smaller guns than 150-mm are useless.

(10) Tanks will not be brought into towns.

(11) Areas occupied will be systematically searched.

b. Defense

(1) The enemy must not be able to pick out the main defense areas. These should therefore not be on the edge of the town, where strongpoints only should be used to threaten the enemy's flank.

(2) Important buildings must be defended from positions outside, and not from the building itself.

(3) The enemy should be driven into pockets, and any advanced elements cut off by sudden flank attacks.

(4) All windows will be left open so that the enemy will not know out of which window fire may come, and thus he will be unable to concentrate his own fire.

(5) Do not fire from the window-sill, but from a point as far back as possible.

(6) Remove tiles to make loopholes. Good positions can also be obtained behind chimneys.

(7) Barricades must be properly erected and well covered with fire.

(8) Use all means possible to keep streets illuminated at night.

12. BRITISH NOTES ON STREET FIGHTING

The following report on street fighting was taken from a lecture given by a British major to soldiers attending the Commando school.

* * *

It is conceivable that one or more independent companies might, on occasion, be called upon to occupy a town or village held by an enemy garrison, and to hold it for a limited period against attack. Such an operation may be facilitated, and casualties lessened, by remembering certain lessons resulting from the street fighting which took place in the Spanish Civil War, especially around Madrid at the end of 1936 and the beginning of 1937.

The vital essentials of the attack are surprise and speed. If the enemy has any warning of the attack, he will very quickly be able to turn every house into a fort,and an independent company, lacking heavy artillery and air support, will find it very costly, if not impossible, to turn him out. The greatest care in planning, and the utmost secrecy are therefore necessary.

Once the attack is launched, the enemy must be kept continually on the run, and not given the least respite in which to rally and organize his resistance. Troops must be trained to display the greatest boldness and initiative, since the slightest hesitation may prove fatal to the whole operation; junior officers, especially, must combine a dare-devil recklessness with a cool head. In this type of warfare the motto is "Hit first, hit hard, and keep on hitting." Nothing is more demoralizing to the attackers than a long-drawn-out and indecisive battle in the streets.

When advancing along a street, troops should move in single file along both sides of the street, keeping close to the walls and with an interval of about

3 yards between each man. Each man should watch the windows and doorways of the houses opposite, and be prepared to engage enemy snipers. It may also be expedient to place an automatic rifle or light machine gun at street crossings to give effective covering fire. When movement is possible along the roofs of the houses, picked snipers of special agility and marksmanship should be sent up to the rooftops to cover the advance below. Never approach a doorway into a house, or a room, directly from the front. If there is an enemy behind it he is sure to see you several seconds before you can see him, and he will shoot first. Approach from one side, hugging the wall; then take one or two hand grenades and throw them inside, and follow on in yourself immediately after the explosion, with pistol or rifle at the ready--the pistol is to be preferred. It is fairly certain that if the grenades do not actually kill or seriously wound the defenders, they will knock them out for a few seconds at least.

A house that is strongly defended will have to be taken floor by floor, or even room by room; hence the danger of allowing the enemy to organize any resistance; but once a house has been entered, and fighting is proceeding on the upper floors, the attackers should post one or two men on the ground floor to watch the street and guard against surprise.

Strong resistance in houses is best reduced by working round the flanks towards the rear, and thus enclosing the several defense areas in a number of small pockets which can be reduced one by one.

Mortars, both light and heavy, are most effective in street fighting, owing to their extreme accuracy, the highly demoralizing effect of their bombs, and their rapidity of fire. They are especially useful against street barricades.

Finally, it must be emphasized that a small attacking force in street fighting cannot afford to take prisoners; it is too easy for them to escape and, having escaped, to do great damage to their captors. Furthermore, men cannot be spared for escort.

13. TACTICS ON GUADALCANAL AND NEW GUINEA

The following notes on Japanese tactics were made after observation of fighting on Guadalcanal.

* * *

The Japanese is a night fighter. He does not move or attack in the daylight, or even in moonlight. He waits till a dark night, moves in close, and attempts, by infiltration, to seep through a weak spot in the line. He then attempts to create confusion and thereby allow other Japanese troops to enter the line. Presumably, in case of a breakthrough, he would consolidate the next day, and prepare for another attack. In case of a rout, he would undoubtedly

continue the attack in the daytime.

One method of attack used was for an advanced detail to move in quietly, followed by a larger detail making considerable noise. The noise of the large detail subsequently covered the cutting of wire, brush, etc., by the advanced detail and allowed it to break through the lines. When our troops heard the larger of the two details, they allowed them to approach to very close range before opening fire. However, by this time the smaller detail was in rear of our force and began to fire. Unless proper security measures are taken to give warning of this and similar tricks, the effect of the fire from the rear is apt to be so demoralizing as to cause troops to break.

Defense against Japanese attacks must principally be against infiltration. It is obviously impossible for defense lines to be manned with a man every 2 feet, and even though it were possible to have the men this close together, some Japanese would still seep through. A defense should be organized with strongpoints properly adapted to terrain features. If possible they should be organized for all-around defense, with barbed wire and land mines in front of positions, and wire behind. Intervals between strongpoints must, of course, be covered with strong automatic and mortar fire, and if the intervals are large enough, with artillery fire. Reserve elements should be employed to wipe out the isolated enemy elements that break through.

Several bands of barbed wire should be laid around a position, and for this use concertina wire is preferable to the double apron, as it is much harder to cut. Troops expecting to defend in jungle terrain should carry large amounts of concertina wire. It is suggested that several tin cans or other noise-making devices be strung along this wire so as to betray the general direction of attack.

The Japanese use very few commands in battle. Apparently the troops are thoroughly drilled in the particular operation and continue through with it. Very pistols, somewhat similar to ours, are used to show the direction of advance. In the attacks against us, a red Very pistol light was used, and served the purpose of converging all units in that particular vicinity toward a certain direction. This, when discovered, enabled us to move reserves to the threatened area. A green Very light meant a withdrawal. If Japanese signal lights can be captured and used, it would undoubtedly be possible to create confusion in their lines by shooting off flares at the wrong time. Our own Very pistol flare differed enough from the Japanese light so that it did not fool them.

Quite a number of the Japanese, probably officers, speak perfect English and use this to trick our troops. On one occasion a Japanese was heard to call out, "Hold your fire, we are American troops. I am bringing in a patrol." Upon several occasions our telephone wires were tapped, and attempts made to get the operator to divulge information. In using the telephone, some type of authenticator must be used, and even then no information of value should be transmitted over the phone. The same applies to radio transmission.

The Japanese are not good shots. Over a hundred yards "they can't hit the well-known bull with a bassfiddle." They have plenty of machine guns, both light and heavy, but are unable to use them to the best advantage. They almost always fire in one direction, and very seldom traverse. Their clips hold 30 rounds, and the gunner generally fires the entire clip without stopping.

The Japanese we encountered were long on guts and short on judgment. They charged time and again against machine guns and 37-mm guns loaded with canister. They seemed unable to change a plan once decided upon and attempted to carry it out even though it was apparently impossible. This is no doubt due, to some extent, to the impossibility of getting the changes around in a night battle. If beaten, and he must be badly beaten before he is stopped, he withdraws to some predetermined bivouac area to "lick his wounds," reorganize, and prepare a new plan. Aggressive patrolling should be conducted the day following an attack in order to drive his patrols away from our positions. Strafing and personnel bombing should be used as much as possible, as well as artillery concentrations.

Grenades are used extensively by the enemy. The Japanese grenade can be used either as a rifle or as a hand grenade. Strictly speaking, it is not used as a rifle grenade but is fired from a grenade thrower.

The training of troops likely to fight the Japanese should be at least three-quarters at night, - night marches, night attacks, organizing defense at night, etc. Each individual must be trained so that no matter what the situation may be, he will not become panic-stricken, but continue to fight. There will be times when bodies of troops will become separated, but they must continue their effort and not try to withdraw. Each individual must understand every detail concerning the operations.

* * *

A high-ranking American staff officer who observed operations in New Guinea submits the following brief comments about what he saw of Japanese tactics and his opinions as to the measures designed to cope with such tactics.

"The Japanese have covered themselves defensively by a multitude of extremely well-constructed and camouflaged bunkers (or combination coconut tree trunks and earth pillboxes). Progress in advance can only be made by killing and/or 'digging out' the Japanese occupying each bunker--a slow, tedious and difficult process.... The operations have demonstrated one thing conclusively, and that is the need for more detailed, extended, and thorough training of the individual soldier and the squad, section, and platoon leaders. Scouting and patrolling, reconnaissance, and all phases of small unit leadership should be featured.... The individual should be trained in finding his way through thickly wooded and swampy areas and should be taught that such areas are an advantage to the offense instead of something to be looked on with concern and hesitation. The fear of swampy areas should be overcome by wading through them in training. Night field training should be the rule and daylight field operations the exception...."

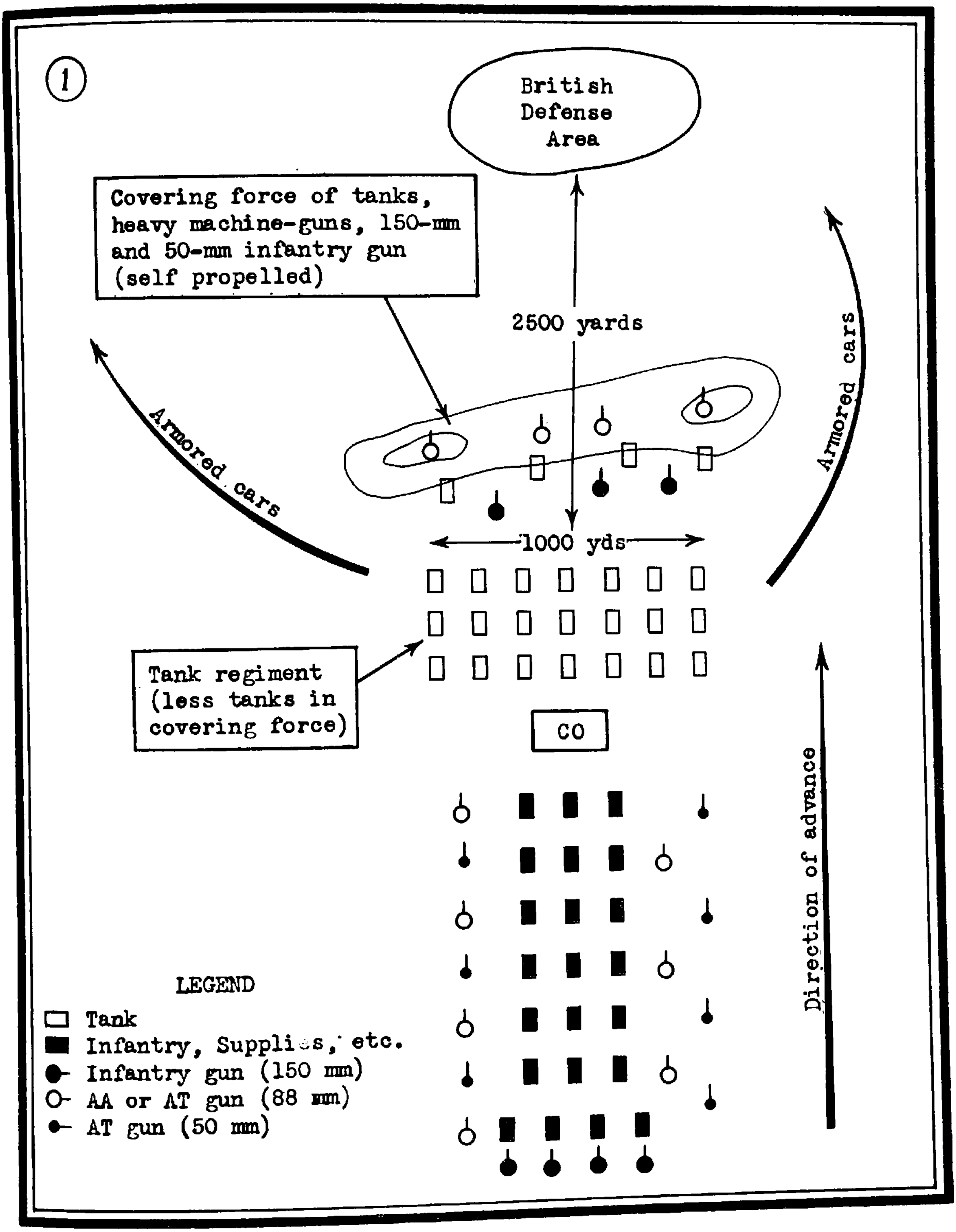
14. GERMAN METHODS OF ARMORED ATTACK BY SMALL UNITS

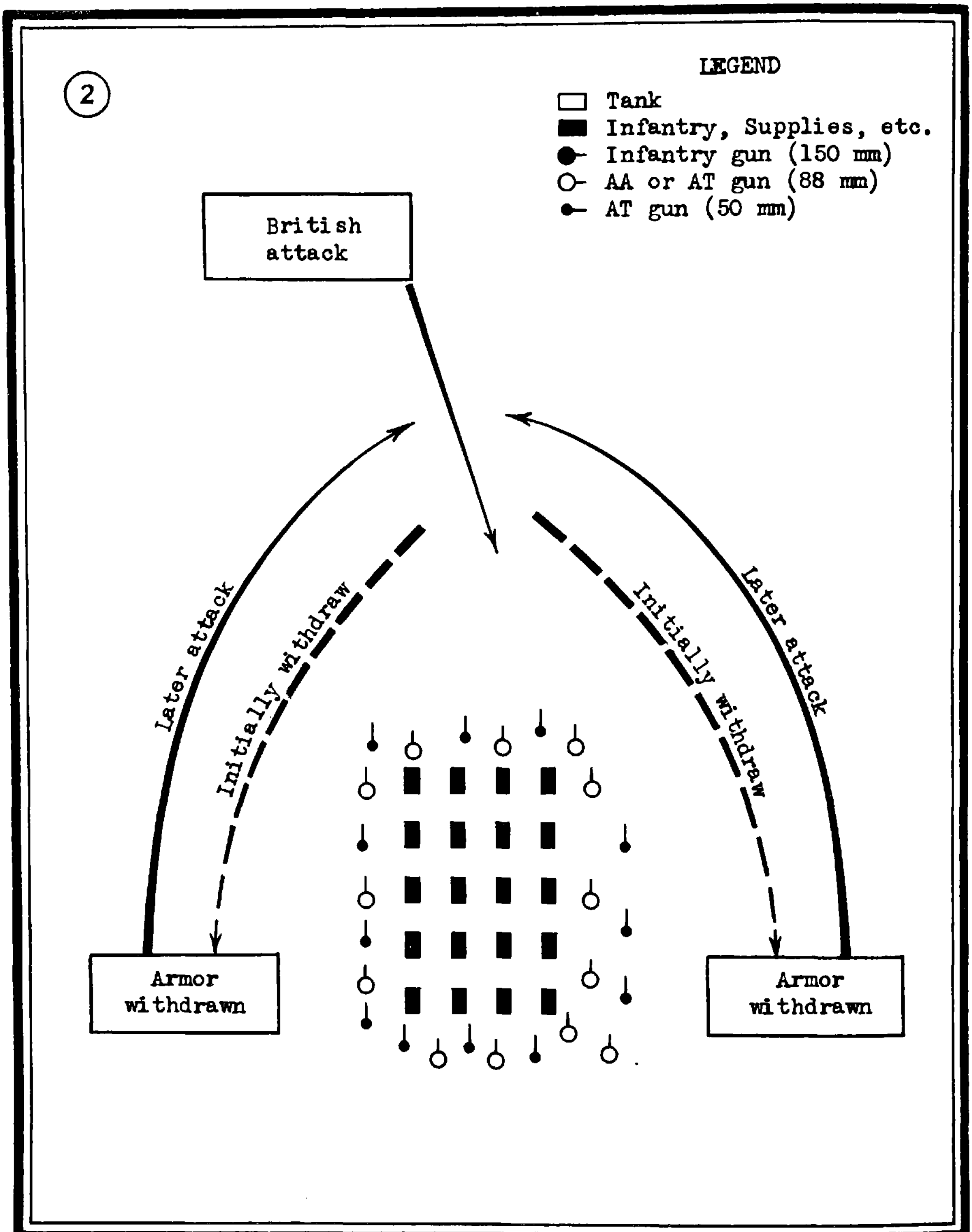
The following report on German tactics in Libya gives in sketch form the small unit tactics as referred to in Tactical and Technical Trends, No. 16, p. 25.

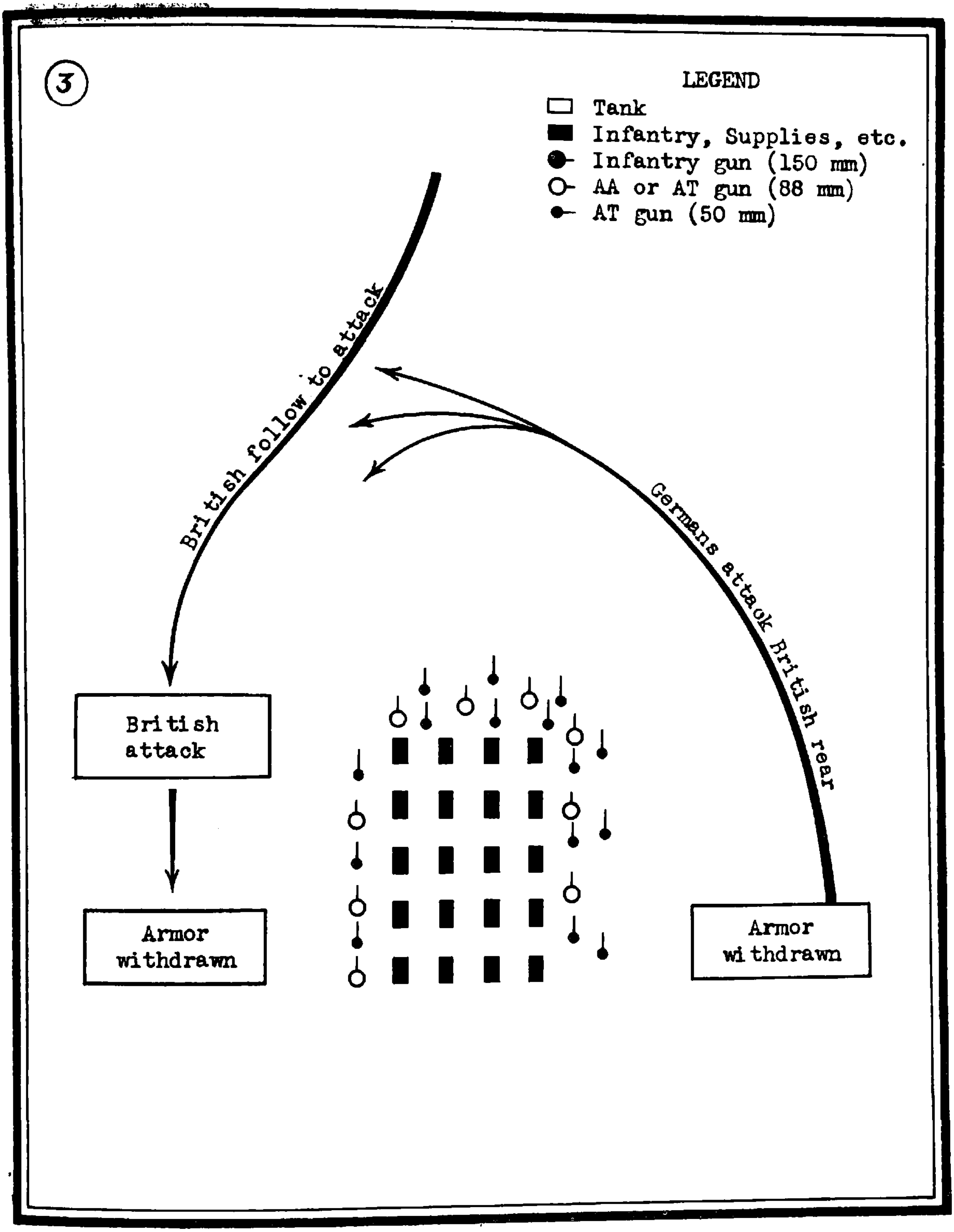
Sketch No. 1 illustrates Rommel's method of advancing to the attack. The field artillery in the box is usually not deployed, but remains in the box. The armored cars have presumably formed a screen and cleared the front, and are working around the flanks of the defense area.

Sketch No. 2 depicts the movement of Rommel's units when he decides not to attack, but to withdraw to a more favorable position. As shown in the sketch, when attacked frontally, the German armor (A) which has been leading the advance falls back to the flanks, and the forward guns, which had been close behind the leading tank, fall back and form the front face of the box. The guns on the rear face of the box are not deployed, but move in column until the battle actually commences. In the event that the British attack the box frontally, the German armor, which had been withdrawn to the flanks, can be employed in a double envelopment.

Sketch No. 3 shows the action of the German units when the British attack on the flank rather than frontally. The movements are the same as in Sketch No. 2 until the British definitely commit themselves to an attack on a flank. Then the German units proceed as illustrated, with the result that the British find themselves attacked on three sides and possibly four: from the front, by the armor which has withdrawn in the face of their attack; from the flank, by fire from the box; and from the rear and far flank by the German armor from the opposite side of the box which initially withdrew, and then, after the British had definitely committed themselves to flank attack, swings around to the rear and far side of the attacking British.


1
British Defense Area
Covering force of tanks, heavy machine-guns, 150-mm and 50-mm infantry gun (self propelled)
2500 yards
Armored cars
Armored cars
1000 yds
Tank regiment (less tanks in covering force)
CO
Direction of advance
LEGEND
Tank
Infantry, Supplies, etc.
Infantry gun (150 mm)
AA or AT gun (88 mm)
AT gun (50 mm)


2
LEGEND
Tank
Infantry, Supplies, etc.
Infantry gun (150 mm)
AA or AT gun (88 mm)
AT gun (50 mm)
British attack
Later attack
Initially withdraw
Initially withdraw
Later attack
Armor withdrawn
Armor withdrawn


3
LEGEND
Tank
Infantry, Supplies, etc.
Infantry gun (150 mm)
AA or AT gun (88 mm)
AT gun (50 mm)
British follow to attack
Germans attack British rear
British attack
Armor withdrawn
Armor withdrawn

15. RUSSIAN TANK CAMOUFLAGE IN WINTER

The following report is a translation of a Russian article on tank camouflage in winter. The original article was written by a colonel in the Russian Army.

* * *

a. General

Winter camouflage of tanks presents a problem with certain special features, created on the one hand by the general winter background, and on the other by weather conditions which greatly affect the tanks themselves and their employment under combat conditions. In winter the change in the operational characteristics of the tanks and in the conditions of employing them in combat will influence the work to be done toward camouflaging them.

Winter conditions (as has been shown by combat experience) create considerable difficulties for the camouflage of tank units. In winter the principal characteristics of a region are its uniform white background, a lack of outline, and an almost complete absence of color. The only exceptions are small settlements, woods, and thick underbrush. Forests whose dense foliage provides perfect concealment in the summertime lose their masking qualities completely in the winter. In winter, on an even, white blanket of snow, camouflage is very difficult. Almost all methods of camouflage employed in summer prove inapplicable. It is necessary to make wide use of special winter covering for the vehicles, and to paint them with winter paint: all one color (protective coat) or in large spots (disruptive).

In winter, tracks made by moving vehicles can be easily recognized, not only from the air but also from high ground observation posts. The removal of tracks left by tanks is the personal responsibility of the commander of the tank units and of the crews. The presence of a blanket of snow, which is often very thick, greatly reduces the mobility of tanks, and as a result reduces the possibility of tanks appearing quickly and suddenly from directions unexpected by the enemy. Tanks cannot go through more than 3 inches of snow without appreciable loss of speed. The deepest snow through which a tank can go is 3 feet; for practical purposes tanks can operate in 1 1/2 feet of snow. It is apparent that these conditions greatly reduce the possibility of using approach routes concealed from enemy observation. Snow makes it necessary for tanks to employ existing roads, which means that they must engage in all their combat operations in those parts of the terrain which are under the special observation of the enemy.

An important winter factor from the point of view of concealment is the longer period of darkness, which helps to conceal the movement and disposition of tanks, provided, of course, that all camouflage measures are carefully observed.

Another winter factor which may be considered important from the point of view of camouflage and concealment is the greater cloudiness of the sky, which hinders reconnaissance activity by enemy aviation and sometimes stops it completely. Then too, tanks may make use of snowstorms which produce conditions of bad visibility and audibility, and as a result tend to lessen vigilance on the part of enemy observation posts.

b. Tank Painting

In winter, tanks are painted all white when the aim is to avoid observation, and in two colors with large spots when the aim is to avoid identification.

As a rule, all-white paint is employed in level, open country characterized by a lack of variegated color. Two-color disruptive winter paint is used where the ground presents a variety of color, where there are forests, underbrush, small settlements, thawed patches of earth, etc.

One-color camouflage paint is applied to all parts of the tank in one or two coats. For the paint, zinc white or tytanium white is used only with an oil base, and slight amounts of ultramarine coloring. For the lack of anything better, the tanks may be painted with chalk dissolved in water.

Painting in two colors with large spots can be undertaken in two ways: one is to paint only part of the tank surface, leaving about 1/4 or 1/3 of the tank's surface in the original green; another is to repaint the tank entirely in two colors, either white and dark gray, or white and gray-brown.

When the weather is cold, painting should take place in a warm place, since paint applied when the temperature is 10° below zero Fahrenheit is too hard to be applied.

In winter, as in summer, it is necessary to avoid mechanical repetition of patterns and colors. For example, in painting the tanks of a platoon, one or two tanks are painted white, a third in white irregular stripes leaving parts of the protective green paint as it is, the fourth with white and dark gray spots, and finally, the fifth with white and grayish-brown spots.

c. Covers and Ground Masks

For winter tank camouflage, one may use nets made of cord which have fastened to them irregular white patches of fabric, about 1 yard across. A large all-white cover also may be used.

When using white winter covers, it is necessary to pay attention to the degree of whiteness of the materials used, for even if a little yellow shows or if part of the material is soiled, it will sharply outline the cover and the tank against the background of pure white snow. A simple method to improve this camouflage is to place a thin layer of snow on the cover.

In winter, ground masks are also used. But the construction of these camouflage masks involves special considerations dependent on the character of the background. The principal camouflage materials employed are irregularly shaped pieces of white fabric or painted white matting. In addition to the white patches, dark patches should be fastened to the material to give the appearance of bushes, tree tops, or other natural ground features. For dark patches one may use tree branches and other similar materials. As with covers, the use of white patches alone, or of a combination of white and dark patches, will depend entirely on the terrain and the coloration of the surroundings.

To attach the patches to the mask, they are frozen on after wetting the material with water.

d. Dummy Tanks

Drawing the attention of the enemy to dummy tanks has the same aim in wintertime as in summer, namely, to deceive the enemy concerning the disposition, types, and character of tank activity. However, in winter the making of dummy tanks is subject to certain special conditions. Large dummy snow tanks may be made by packing snow into the form of a tank, showing the hull, the suspension system, and the turret, and then spraying with paint. Movable life-size models are constructed not on wheels but on skis. "Flat" models may be made simply by treading the snow into the contours of a tank. In all other respects the making and use of dummy tanks in winter is no different than in summer.

e. Camouflage while in Motion

Generally speaking, winter conditions make it necessary to move along existing roads. Since winter roads appear to the aerial observer as dark strips, tanks which have an all-white winter paint stand out fairly clearly. In view of the fact that vehicles can be spotted by the shadow they cast, they should move on the side of the road nearest to the sun so that their shadow falls on the road, which is darker than the snow next to the road. Movement along the roads, especially at great speeds and over fluffy dry snow, gives itself away by clouds of snow dust. For this reason, movement of vehicles in wintertime should be at low speeds, especially over new-fallen snow. The tracks left by the tank treads stand out clearly as two dark parallel strips with tread impressions. These can be obliterated by sweeping the road. When tracks are left on the hard crust of the existing road it is necessary, instead of sweeping, to remove them with the aid of graders.

When the tanks pass through places where turns are unavoidable, there appear everywhere little heaps of upturned snow; these are characteristic marks and betray the movement of tanks. To prevent this, turns must be made gradually in a wide arc whenever practicable, or else the heaps of snow which are formed must be cleared away.

The reflection from the lenses of the tank headlights will also give away their movement. In order to prevent this, it is necessary to cover the headlights with white fabric covers, or some other material.

Finally, among the most important factors betraying the movement of tanks to ground observers is the clank of the tracks. [Russian tanks tracks are of all-metal construction.] The noise of these can be heard better as the temperature falls. Naturally, when operations are in the immediate vicinity of the enemy, one makes use not only of all the ordinary precautions employed in summer for the prevention of noise, but takes into account the special characteristics of winter weather with its increased transmission of sound.

f. Camouflage of Stationary Tanks

In winter, tanks are, generally speaking, parked alongside buildings and in woods and shrubbery; in exceptional cases it may be necessary to station tanks in open flat country or in gullies.

The peculiar characteristic of inhabited areas in wintertime from the point of view of camouflage is the motley appearance of the landscape due to the presence of dwelling places, barns, gardens, roads, and paths. This wealth and variety of outline affords considerable opportunities for concealing the position of tanks from air and ground observation by the enemy.

As a rule, all vehicles in bivouac should be placed under the roofs of sheds and barns. Only where there is an insufficient number of such structures, or where the size of the vehicles makes it impossible to place the vehicles in the existing shelters, is it necessary to build shelters, resembling the existing structures in the given locality. The roofs of these shelters must be covered with a layer of snow so that they will not look any different from the roofs of the existing structures. Just as in summertime, these camouflage structures may be built either as additions to existing structures or as separate structures. The separate camouflage structures should be situated along laid-out paths, and the tracks of the caterpillars which lead to the place where the tanks are stationed should be swept or dragged so as to resemble an ordinary road.

When there is not enough time to construct shelters, it is sometimes possible (as on the outskirts of a village) to camouflage tanks by simulating haystacks, piles of brushwood, stacks of building materials, etc. This is done by strewing over the vehicle a certain quantity of material at hand and covering it with a thin layer of snow.

Woods, orchards, and brushwood can be used for camouflage purposes in the wintertime only if additional camouflage precautions are taken. Since leafy woods offer much less concealment in winter than in summer and do not hide the vehicles from air observation, they must be covered with white covers, and there should be strewn over them broken branches or some other camouflage material such as hay, straw, etc.

When there are no white covers, the vehicles may be covered with dark ones, but snow must be placed on top and scattered. Dark covers can be used only against a background which has natural black spots. Finally, if no covers of any kind are available, the vehicles should be covered with branches, straw, hay, and the like, and snow placed on top in irregular patches.

When the tanks are stationed in open flat country, then the camouflage of the tanks also involves the breaking up of the uniform aspect of the locality, which is done by treading around on the snow. Then these areas are given irregular form by scattering here and there patches of pine needles, straw, and rubbish. The ground should also be laid bare, as tanks which are painted a dark color will not be easily discovered against a dark background, either by visual air observation or by the study of aerial photographs.

In open country, thaws are particularly favorable to camouflage of tanks, for the disappearing snow exposes portions of the surface of the ground. The result is that the ground assumes a naturally mottled appearance, and the contours of vehicles stationed there are easily blended.

When there is deep snow, tanks may be placed in snow niches built near snowdrifts along the road. The entrances to these should be directly off the road in order to avoid tell-tale tracks of the treads. On the top the niches are covered with white covers, or with some other available material over which snow is placed. In order to camouflage the entrance, it is necessary to use hangings of white cloth or painted mats which may be readily let down or pulled up.

When the tank is stationed in a gully, it is covered with solid white covers of any kind of fabric or matting painted white, or by the regulation net, with white and black patches attached to it.

MEDICAL

16. EFFECTIVE USE OF FIRST-AID KITS

The following incident reported from the Solomon Islands demonstrates the value of first-aid kits. It is believed that the life of a U.S. Navy airman, whose chest was pierced by a .707-mm bullet, was saved by the use of a first-aid kit prepared by a Navy lieutenant. This kit contained sulfanilamide powder, sulfathiazole tablets, morphine, and bandages. It had an accompanying sheet of mimeographed instructions with diagrams as to the use of the kit for various types of wounds. The fact that the wounded man did not have a sign of infection after a period of 7 days on an island seems proof of the effectiveness of this kit.

17. GERMAN INTERROGATION OF PRISONERS OF WAR

The following report on interrogation of prisoners by the Germans is from a German document on that subject. It is believed that a knowledge of the type questions which might be asked of prisoners of war will be useful to unit commanders for instruction on safeguarding military information.

a. Printed Form

The printed form shown on the following page is required to be completed regarding each British prisoner of war. It is issued in pads.

b. Further Questions

Further questioning may include one or more of the following questions:

(1) Have there been any alterations in the Order of Battle as printed in the [German] handbook? Are alterations in progress, particularly with regard to armored formations?

(2) How far have infantry and other units been equipped with antitank and light antiaircraft units?

(3) With which units are there signal units which do not belong organically to the division?

(4) What is known about the Air Corps or the airborne divisions (parachute and airborne troops)? What is known about the strength, organization, training, equipment, and armament of Commandos and Special troops?

(5) What is the effect of our [German] weapons and tanks, technically and with respect to morale? What about losses in personnel, weapons, and equipment?

(6) What is known of the Amphibious Command, new weapons, new tanks, or new armament, and of armor on known types of tanks?

(7) What is known about active and passive chemical warfare preparations?

(8) What rumors are there about future operations?

(9) What is the situation at home concerning the formation of new units, movements overseas, supply and food situations, opinions as to the prospects in the war, and general morale?

No. 01061 FORM FOR INTERROGATION OF BRITISH PRISONERS

(Interrogating Unit) (Place) (Day)

To.

CHIEF OF THE GENERAL STAFF OF THE ARMY.

Dept. Foreign Armies. - West

To be transmitted by the quickest means.

Name: Christian Name: Year of Birth: Rank: Number:	Taken At On	Unit	
		Name	Army Corps Div Brig Bn Type of Co

Regular Army or Territorial Army.			Mobilization and transport overseas.				
	Place	Command	Date	T.O. of Unit	Embar-kation Place Date	Dis-embark-ation. Place Date	Route taken (places & dates)

Unit arrived in the line.	What units in the same Div?	Other units known.
At From To		Name Div Place Date

Particulars of weapons, tanks, equipment, antigas equipment.

Morale:
(Losses)

Other important items.

Remarks:

1. Important papers (diaries, orders) are to be attached to the copy sent direct to the Chief of the General Staff.
2. Items of only local interest are to be put on a special sheet for interested units.

18. AMMUNITION FOR GERMAN ROCKET PROJECTOR

The German 150-mm six-barreled rocket projector has already been briefly described in Tactical and Technical Trends, No. 10, p. 23. During the past week, pictures of what appeared to be this weapon were published in press releases from the Russian front. It is used primarily for smoke and chemical agents and is an item of general issue to certain German chemical troops. HE is also fired.

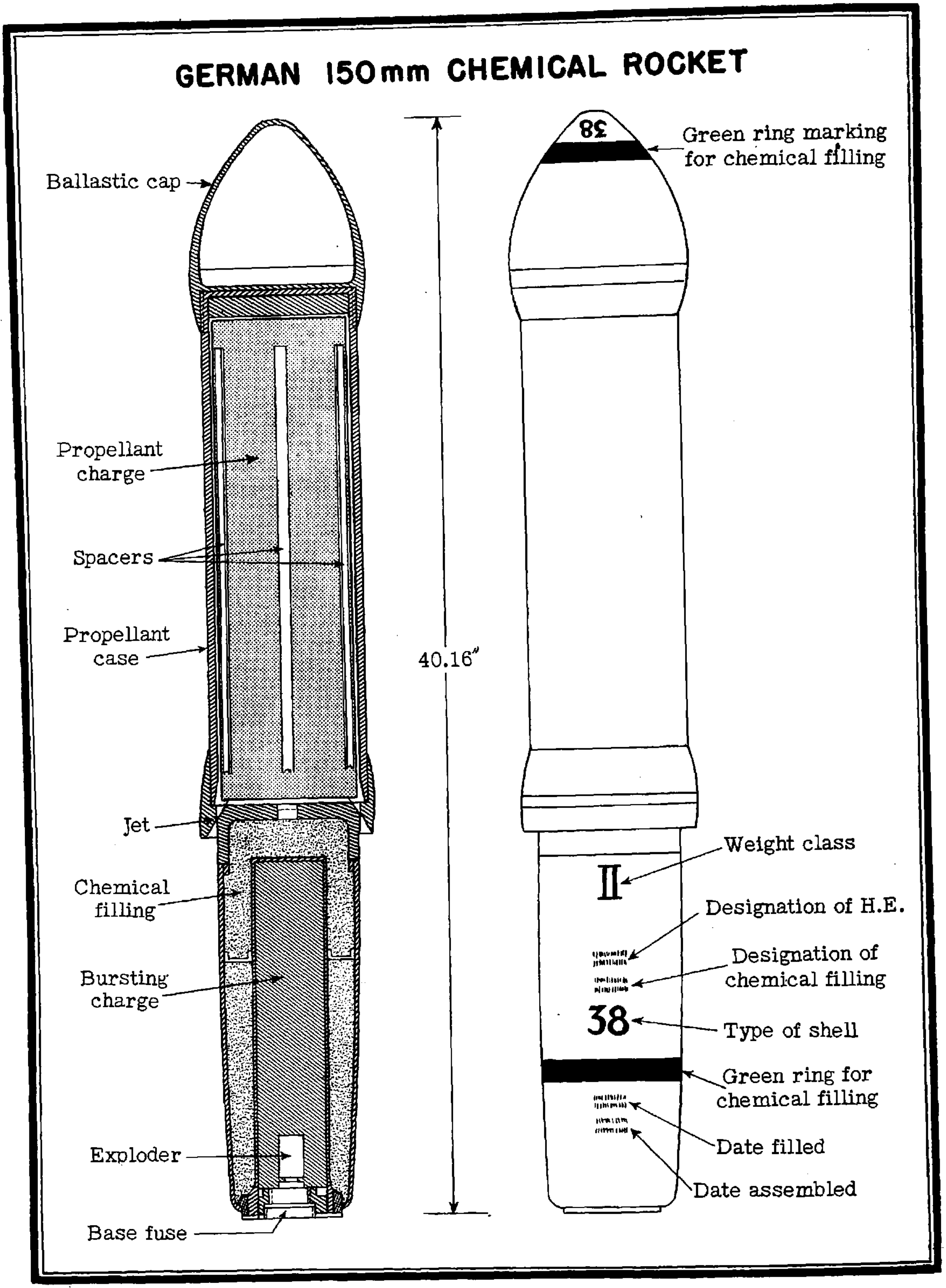
The projectiles (see accompanying sketches) are loaded at the muzzle, the nose projecting beyond the muzzle. They are electrically fired. While reported to weigh about 22 pounds, this figure seems unusually low for a projectile of 150-mm caliber.

Though the projector barrels are smooth bore, the projectiles are thought to rotate in flight; it is believed that this rotation is achieved by offsetting the jets or venturis. The number of jets is not known. Contrary to the usual type of rocket, the propellant is located in the front end of the projectile, the jets being about midway between the nose and base. It is considered that supplying the driving force at this point, instead of from the rear, is likely to give greater stability in flight. There is evidence that the chemical rocket has diglycol* or black-powder propellant charges; while the report is not clear in this respect, the propellant of the HE rocket would presumably be the same. What is referred to in the sketches as "spacers" are believed to be projections on the inside of the propellant case to hold the propellant stick away from the casing. The purpose of the resulting air space is apparently to permit the ready movement of the gases toward the jets. There are probably six of these spacers.

In the sketch of the HE rocket it will be noted that there is an air gap between the propellant case and the top of the HE casing; the purpose of this is presumably to guard against detonation of the HE filling by the heat generated by the burning of the propelling charge. This air gap is not present in the chemical rocket, the chemical filling presumably acting as an insulator.

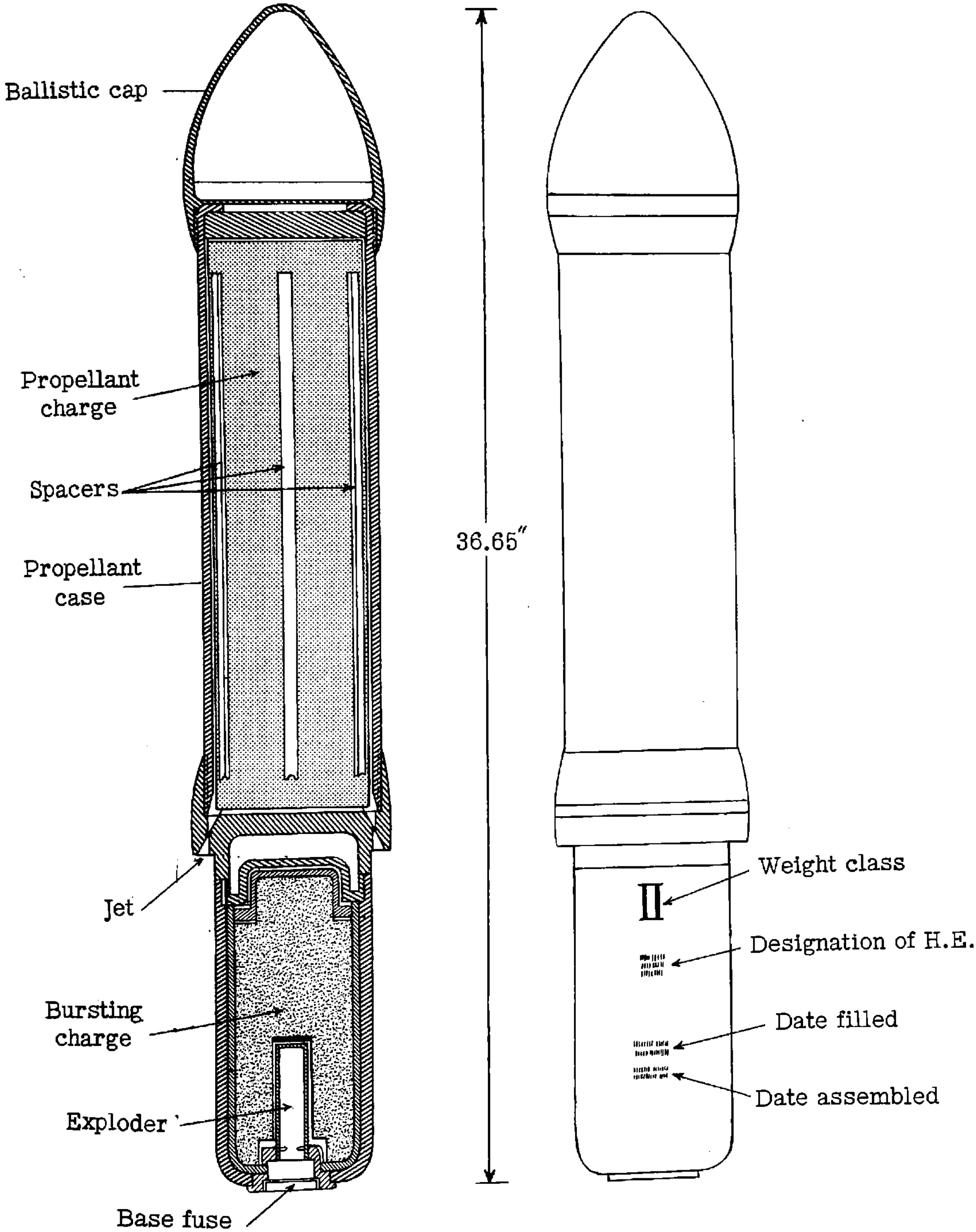
As already stated, this rocket is of both the HE and chemical types. One type of chemical filling is indicated by green rings, one on the cap, or nose, the other on the casing for the filling. The exact significance of the green ring marking is not known. However, all German green-ring charges are known to have a limited vesicant action; one of them has practically no smell, and two others are said to have a faint smell resembling mustard.

*This is believed to be diethylene glycol dinitrate. The propellant is probably a double-base powder in which diethylene glycol dinitrate, instead of nitroglycerine, is used with the nitrocellulose.



GERMAN 150mm CHEMICAL ROCKET
Ballastic cap
Propellant charge
Spacers
Propellant case
Jet
Chemical filling
Bursting charge
Exploder
Base fuse
40.16"
38
Green ring marking for chemical filling
Weight class
II
Designation of H.E.
Designation of chemical filling
38
Type of shell
Green ring for chemical filling
Date filled
Date assembled

GERMAN 150 mm H.E. ROCKET



QUARTERMASTER

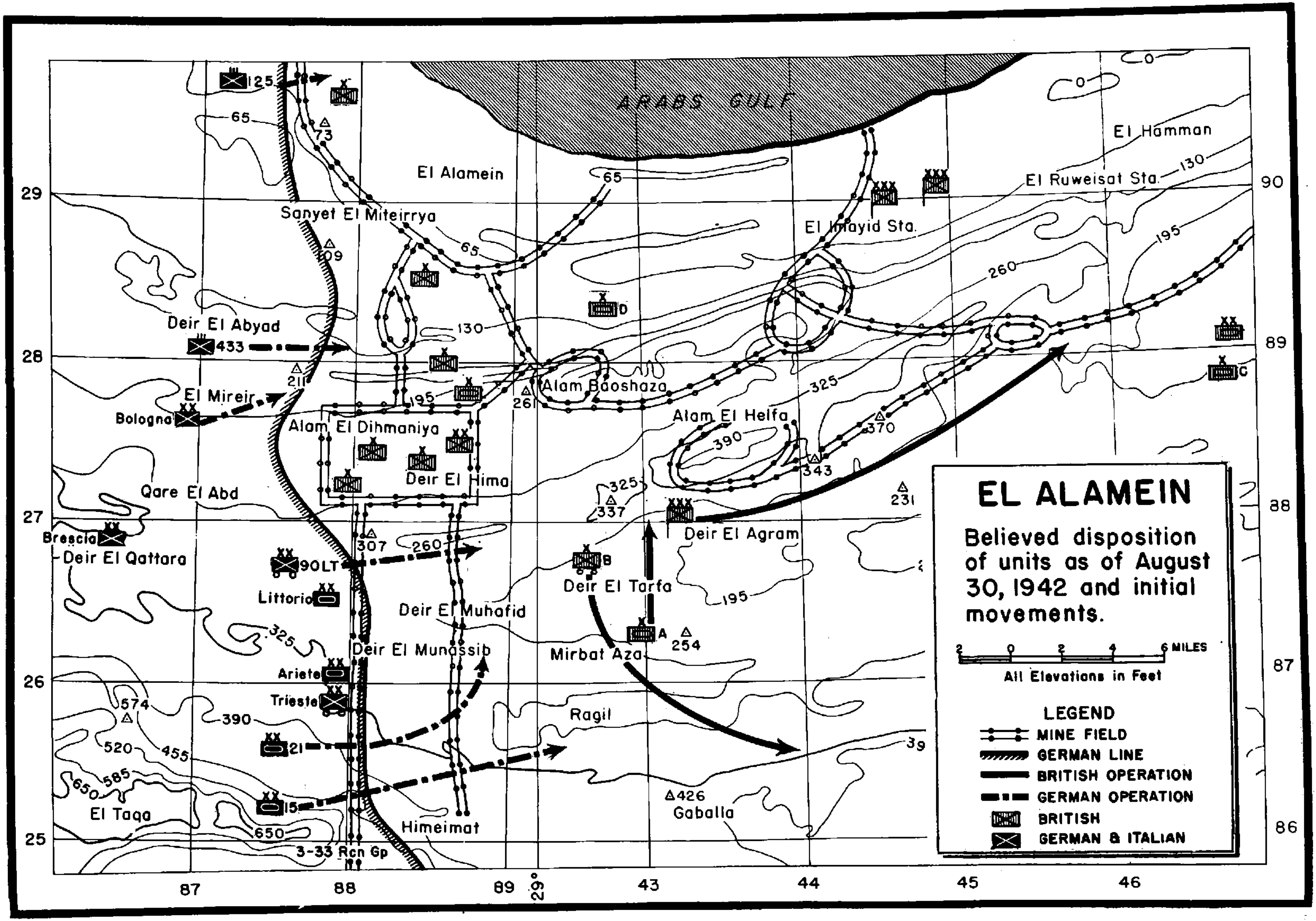
19. GERMAN MOTOR VEHICLE ROAD TRAINS

Aerial reconnaissance over western Germany in May 1942, showed the use of a motor vehicle road train by the Germans. The train observed appeared to be about 260 feet long and to consist of one very large tractor and seven trailers. The trailers each seemed about 25 feet long. Speed of the train was estimated at 8 to 10 miles an hour.

Comment: Road trains have been observed in Germany during recent years. They usually consisted of a tractor (wheeled prime mover) and two or three trailers; no more than four trailers per train were ever observed. It should be noted that the practical use of a long train as described in the paragraph above would be restricted to highways like the Reichsautobahn in Germany, which are very wide, have easy grades. no cross traffic, few and very gradual curves, and avoid all towns.

SECTION II

GERMAN ATTACK AT EL ALAMEIN: AUGUST 31-SEPTEMBER 5, 1942


EL ALAMEIN
Believed disposition of units as of August 30, 1942 and initial movements.
2 0 2 4 6 MILES
All Elevations in Feet
LEGEND
MINE FIELD
GERMAN LINE
BRITISH OPERATION
GERMAN OPERATION
BRITISH
GERMAN & ITALIAN
ARABS GULF
El Alamein
Sanyet El Miteirrya
El Hamman
El Ruweisat Sta.
El Imayid Sta.
Deir El Abyad
El Mireir
Bologna
Alam El Dihmaniya
Deir El Hima
Alam Baoshaza
Alam El Helfa
Qare El Abd
Brescia
Deir El Qattara
90LT
Littorio
Deir El Agram
Deir El Tarfa
Deir El Muhafid
Deir El Munassib
Mirbat Aza
Ariete
Trieste
21
15
Ragil
Gaballa
El Taqa
Himeimat
3-33 Rcn Gp
125
433
A
B
C
D
29
28
27
26
25
90
89
88
87
86
87
88
89
29°
43
44
45
46

GERMAN ATTACK AT EL ALAMEIN
AUGUST 31-SEPTEMBER 5, 1942

INTRODUCTION

After the British attempt to penetrate Rommel's lines on July 27, 1942 had failed, the Egyptian front settled into a more or less stagnant period for a few weeks. During this period, outside of the constant artillery fire, night patrolling, and usual air activity, little in the nature of active military operations took place. Most of this time was utilized by both sides in preparing defensive positions and building up strength in personnel, equipment, and supplies.

During the month of August the British reached a new high in morale. This change in attitude was attributed by observers to three main factors. First, the complete turnover which had taken place in the supreme command. General Alexander, a World War I veteran, noted for his aggressiveness and the leader of two brilliant actions of World War II, had replaced General Auchinleck as High Commander in the Middle East. Now under Alexander and in direct comman of the British Eighth Army, was Lieutenant General Montgomery, a veteran of the fighting in France in World War II, and a soldier's soldier. Second, the quantity and quality of rations, which in the past had left much to be desired, had increased to a point where the British Tommy was not the underfed and undernourished soldier that Rommel's troops had previously faced. Third, the British had gained a much-needed and well-deserved rest.

The British, in particular, were very thorough in their plans for the anticipated battle with Rommel's forces. About the middle of August it became evident, from the nature of the position that the British were taking, that they did not intend to attack, but instead that their strategy was based on the fact that Rommel could and would. With this thought in mind, the British prepared their position for defensive action only. By restricting themselves in this fashion, the British hoped to be able to keep their armor from falling into antitank ambush, similar to that which had caused their defeat a few weeks earlier. Since they planned to remain on the defensive, the British were also able to site their guns so as to have immediate antitank and artillery support, which had been lacking in the earlier attack.

After the British command had committed themselves to the defensive, they spared neither time nor labor to make certain that no possible contingency could arise which would frustrate them. Every man had been instilled with the feeling that he, and he alone, might mean the difference between victory and defeat. The line that they would be defending was commonly known as "Egypt's Last Hope"; with its fall, Egypt was lost. During the period from the June 27 attack to the latter part of August, every conceivable defensive position had been tested all along the entire line. Terrain exercises and maneuvers were going on constantly, testing and improving the defenses. All tanks had been moved in and out of pre-selected battle positions, actually dug in, and placed in hull-down and gun-down positions. All drivers and all gun crews were thoroughly familiar with their duties and positions. Likely targets had been registered upon, and gun and tank crews had gone to their positions in darkness.

GERMAN PLANS

Of Rommel's general plan little is known. It is known that he was preparing a strong position and his armored strength increased in tanks, both German and Italian. German and Italian parachute troops made their appearance on this front, as well as elements of the German 164th Division. Despite continual bombings by British and American planes, the port facilities at Benghasi, Tobruk, and Matruh were still open, and through them, some supplies still reached the forward elements. The railroad from Tobruk to Daba also remained open, although traffic was severely hindered by the continual bombing by Allied planes.

Allied air reconnaissance showed that Rommel was regrouping his forces, with a large part of the German and Italian infantry, and the Italian armor, identified on the southern flank of his line, and with the bulk of the German armor behind the center although in a position to join overnight a thrust on the south.

About August 25, the Axis air force began to build up its strength in serviceable planes.

BRITISH PLANS

The British general plan was to prepare several contiguous fortified areas along the coast and to hold them at all costs, and also to cover the high ground of Ruweisat Ridge and the ridge immediately south of it. They also planned to hold the New Zealand "box" covering the western edge of Deir El Hima. The armor was to take up defensive positions along the foot of Alam El Halfa escarpment and maintain this position, thereby intending to force the German armor to fight them on ground chosen by the British. The southern sector was to be defended by two parallel mined areas extending to Himeimat, which is along the edge of the Qattara Depression. The bulk of the British armor was to be held in the south-central sector and well behind the minefields. In support of the infantry defending the fortified areas was an armored brigade (British brigade approximates U.S. regiment). Portions of the light armor and elements of the motor brigade patrolled and guarded the minefields. The light armor on the south would harass any advance, and the armored reserve (another armored brigade) was to be held in readiness to the east.

In the absence of any specified missions, the Royal Air Force, combined with the American Air Force, was to bomb continually and strafe the Axis ports, supply lines, and troop concentrations day and night.

British Intelligence fully expected the Axis offensive to get underway during the full moon on the night of August 25/26. For some reason, said by some to be a lack of fuel, the attack did not materialize at this time. However, on the night of August 30/31, just prior to midnight, Rommel launched the long-expected attack which he hoped would bring him victory, and drive the British from North Africa.

OPERATIONS: AUGUST 31

Rommel's attack on the strongly prepared British El Alamein line commenced at 2320, August 30. At that time German engineers and infantrymen commenced clearing a passage through the western section of the British minefield between the 25th and 26th east-west grid lines in the vicinity of Himeimat.

An interesting sidelight on this preliminary operation, and the subsequent tank penetration, was that the British fully intended to shell the Axis armor while they were confined and restricted in movement during passage through the minefield, but due to a misinterpretation of orders, this was only lightly done. As a result the Axis tanks managed to get through the minefields comparatively unharmed.

The German 15th Armored Division, with approximately 140 tanks, came through the minefield just north of Himeimat practically unharmed, then turned due east. Around noon they were in the vicinity of the 43rd north-south grid. At this point, for some reason not fully understood, they halted their advance, and formed up as though they were expecting a counterattack. When the expected counterattack did not materialize, they formed up in the area east of Deir el Ragil, and proceeded in a northeasterly direction at about 1600. At the same time they detached about 40 tanks, which remained in the area of Deir el Ragil as security for the southern flank. It appeared that the German armor would bypass the principal British position, and, in order to prevent this, and to draw the Germans northward, the British commander sent a detachment composed of two tank battalions south to make contact, and, if possible, draw the Axis tanks north. This move was successful, as the British detachment returned to its previous position closely followed by the 15th Armored Division. A patrol of the 15th Armored Division closed in on the left flank of British Armored Brigade "A"* defending the main position on the southern side of Alam El Halfa, and a short engagement followed. After dark the 15th Armored withdrew to the south, leaving about 13 tanks behind in a wrecked or burning condition.

The German 21st Armored Division crossed the minefield with the 15th Armored, then turned in a northeasterly direction. It reached the area north of Deir el Tarfa at 1700. At this point it came under the fire of the right flank of British Armored Brigade "A" southwest of point 337. As the Axis tanks closed in, a brisk fight followed which lasted till dark. The 21st Armored then withdrew to the vicinity of point 254, leaving approximately 15 tanks burning or totally destroyed.

*For security reasons the British units cannot be referred to in the text by their exact designation. The armored brigades and the motorized brigade which played main roles in the action will therefore be designated by letters (A, B, etc.). By reference to the accompanying maps, the position and movements of these units can be easily followed.

The German 90th Light Infantry Division which was on the north flank of Rommel's southern group, had difficulty in crossing the minefields, but by evening had succeeded in reaching the area north of Deir el Muhafid.

South of the 90th Light were the Italian divisions, Littorio, Ariete, and Trieste, in the area Deir El Munassib. Of these latter three outfits, only the Trieste completely crossed the minefields during the engagement.

German Reconnaissance Groups 3 and 33 advanced east, and then turned south towards the area Qua El Labin.

In the central sector a localized Axis thrust by the German 433rd Infantry Regiment and the Italian Bologna Division against the Indian outfits (aided by the South African and the New Zealand brigades) on Ruweisat Ridge, advanced as far as point 211, but was later driven back by counterattack.

In the northern sector, another localized Axis attack by the German 125th Infantry Regiment was momentarily successful near Tel el Eisa, but was later driven back to its original position by the Australian brigade occupying that sector.

Patrols of British Motor Brigade "B" were active in the east and also in the Himeimat area. The remainder of the British Eighth Army held to their defensive positions, and only fought that part of the Axis forces that attacked them. Allied air support was continuous and intensive, as was the British artillery support, given from the area near Alam el Halfa where it was concentrated.

In a review of the day's fighting, two points stand out. First, the Axis attack did not come as a surprise to the British. Second, the British held rigidly to their preconceived defensive plan. They did not counterattack but waited, as planned, and met the Axis tanks on ground of the British choice.

During the night of August 31/September 1, British Armored Brigade "C", then in reserve, was ordered to advance and tie in with the left flank of Armored Brigade "A" to form a line along the foot of the Alam el Halfa escarpment.

OPERATIONS: SEPTEMBER 1

Just prior to daylight, the Axis tanks formed for the attack. The 21st Armored Division with approximately 50 tanks was along Deir el Agram facing the center of the main British position.

The 15th Armored Division, with about 100 tanks, formed southeast of the left flank of Armored Brigade "A"

At daylight, severe fighting broke out and continued till 1100. During the first hour of the fight, Armored Brigade "C" fought forward from its position in reserve, made contact with the left flank of Armored Brigade "A" on the main position, and formed as directed. This advance by the British armored reserve prevented the envelopment of the left flank of the principal British force.

It should be pointed out that the Armored Brigade "C" had been ordered to the position it eventually took during the previous night. However, the orders were not received until late at night, and execution was not as rapid as was expected.

The engagement was resumed in the late afternoon and continued until dark when the Axis withdrew to point 254 ridge, leaving behind 25 burning or totally destroyed tanks.

During the day a third Armored Brigade "D" went into position between the right flank of Armored Brigade "A" and the New Zealand box.

OPERATIONS: SEPTEMBER 2

During the night, the Axis formed up along the ridge at point 254, on the defensive behind a screen of antitank guns.

After daylight, small and isolated groups of Axis tanks felt out positions occupied by Armored Brigade "D" which had been moved up the previous day, but no attack developed.

The 90th Light Infantry Division commenced withdrawing from its position east of the minefield. It was replaced by the Trieste, supported by the Ariete and Littorio. The Italian Brescia Division moved forward from the area Deir El Munassib, and took up a position facing the southwest corner of the New Zealand box.

Allied bombing and artillery fire was continuous and heavy, both by day and night. Armored car patrols had gone around the Axis line and were harassing Axis supply lines far to the rear.

OPERATIONS: SEPTEMBER 3

The day of September 3 was comparatively quiet. Axis motor transport commenced withdrawing westward along its axis of advance.

During the day British light armor, and patrols from Motor Brigade "B" intensified their harassing activities from the east and south as far west as Himeimat.

Artillery elements joined these patrols and shelled the Axis motor transport from comparatively close-up positions, then withdrew in face of enemy pressure.

The British heavy armor remained in place along Alam el Halfa.

It appeared at this time that Rommel was still undetermined as to his course of action. He had failed to draw the British armor away from its support, or into antitank ambush; in fact, the British failed to play the game the way he wanted them to play it.

OPERATIONS: SEPTEMBER 4

During the early morning hours, the New Zealand Division, composed of the two New Zealand brigades, which occupied the box, assisted by a brigade of another infantry division, laid down an artillery barrage and followed with an infantry attack. This attack advanced south and along the trails in square 88-27.

The attack advanced 3 miles, but with the coming of daylight the Trieste, Brescia, and the 90th Light Division, supported by the Ariete, and Littorio Divisions, in a series of three counterattacks, forced the attacking troops back nearly to their original positions.

This effort served one great purpose, however, in that it was evidently the deciding factor in causing Rommel's withdrawal. The force of this attack prevented him from using the 90th Light in a coordinated attack with the German armor.

The air and artillery attacks were continued on the same large scale as heretofore.

OPERATIONS: SEPTEMBER 5

The bulk of the Axis transport was withdrawn west of the minefields. The 90th Light withdrew off to the west. An antitank screen, supported by tanks, was set up between Himeimat and Deir el Munassib.

This was a slow withdrawal, with Rommel utilizing to the full extent his old scheme of leaving tanks visible as bait for British armor. These tanks were well protected by antitank guns. Formerly the British had always pursued them, and frequently had lost rather heavily. This time, all British armored forces remained in their battle positions, with their artillery continually firing on the retreating Axis forces.

Whenever the pursuing British infantry gun-carriers came within range, the Axis antitank guns picked them off. Rommel withdrew carefully, sustained only a minimum of losses, and eventually halted very close to his original position, retaining only about 2 miles of the ground he had won on the first day.

The Axis line in the southern sector was formed by the Italian Brescia and Trieste Divisions in the northeast part of square 87-26. The Ariete Division was at Deir el Munassib. The 90th Light Division was about 7 miles to the rear of the Ariete, as a mobile reserve. The German 21st Armored Division, the 3 and 33 Reconnaissance Groups, and the Italian Littorio Division covered the area around Himeimat and west to El Taqa.

While the Axis motor transport was retreating through the minefield area, the Axis air force managed to put up a fighter covering force which prevented Allied bombings. This protective covering "umbrella" was only local, however, and Allied bombing of the Axis rear areas continued on an undiminished scale.

When Rommel took up the position mentioned above, he immediately prepared strong defenses, and the El Alamein battle of August 1942 was at an end.

LOSSES

The Axis withdrawal was orderly, and since none of the previous engagements had been on a large scale, the loss of equipment throughout the entire battle was not unduly large.

Observers estimate that the Axis lost not more than 70 of their total of 440 tanks; of those lost, 55 were German.

Approximately 100 Axis motor transport vehicles, of which the majority were captured British vehicles, were destroyed and left on the field.

Judging from the empty cans lying about the areas that the Axis troops had occupied and then given up, the Axis forces appeared to be completely rationed with previously captured British supplies.

The British entered the battle with a grand total of 546 tanks of all types, and lost or had disabled a total of 67 tanks, which included British mediums and American medium and light M-3's. Of the total number of tanks lost, it was estimated that not more than 20 were completely destroyed and beyond repair.

British personnel losses were relatively light. A British corps commander estimated that the Axis losses were greater than the British in a proportion of 2 to 1.

SUMMARY

Rommel first advanced with his entire striking force, but there was no indication that a full-fledged, all-out assault had been launched. It is believed that he hoped to engage the British armor on grounds of his own choice, defeat it, and then occupy Ruweisat Ridge which commands the coast road and the avenue to Alexandria.

When the British tanks refused to come out of their hull-down defensive positions, and away from their antitank and artillery support, Rommel was not quite sure of his ground and was afraid to risk his full strength. He spent 2 days feeling out the British position, losing rather heavily in tanks and motor transport while doing so. In view of later developments, it is also believed that he underestimated British tank strength.

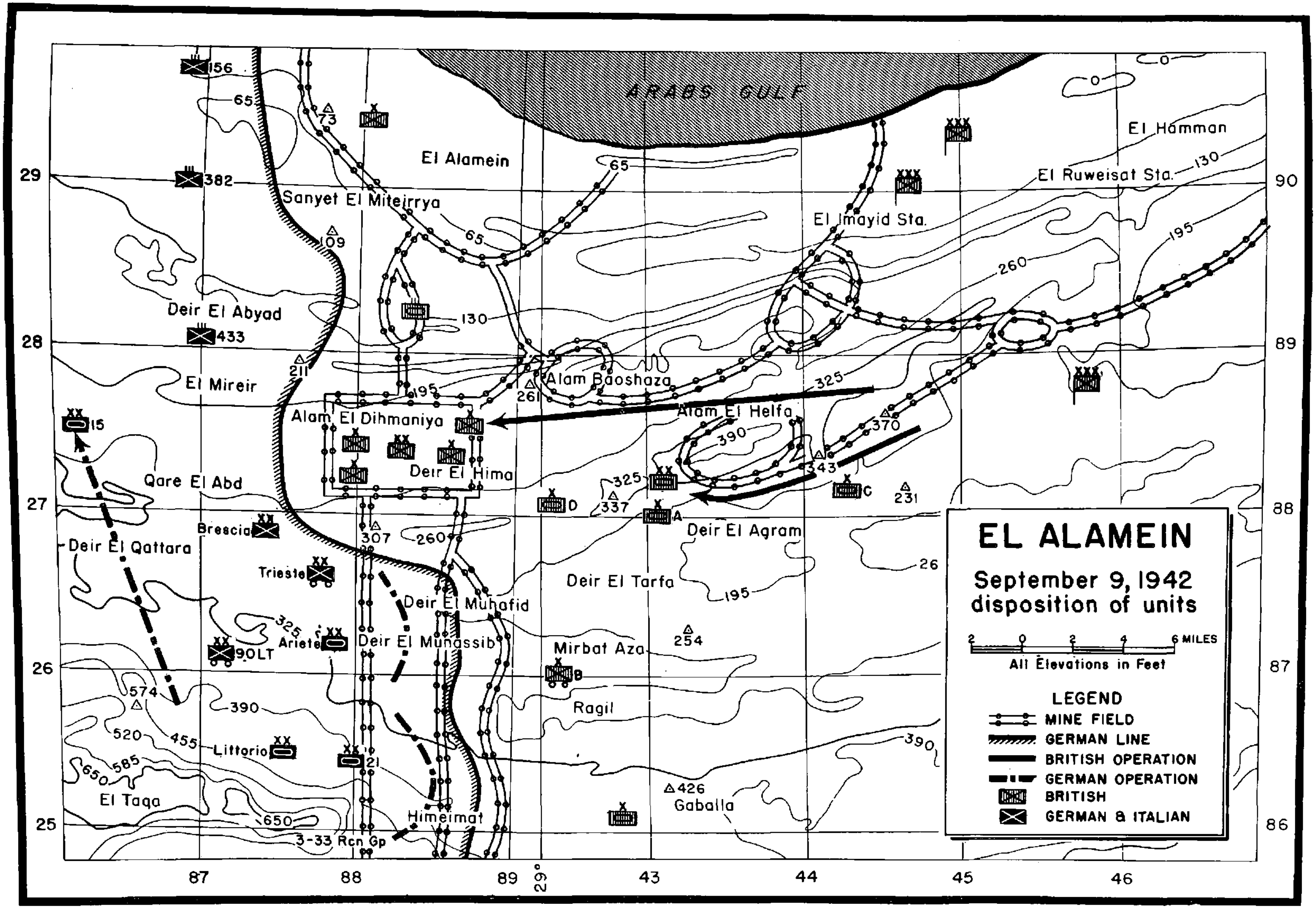
Rommel was not able to bypass the principal British position along Alam El Halfa and then proceed eastwards to the Delta (El Hamman) because of the constant danger to his supply line by the British armor, plus the constant interference from Allied bombing and artillery.

On realizing the full extent of the British strength, Rommel withdrew to his previous line and occupied the strongest defensive position in the Western Desert.

The British success was due to: security; the well-planned defense which had been thoroughly tested by many tactical exercises; a thorough knowledge among troops and unit commanders of what was expected; proper execution and coordination among higher echelons; and the continual artillery and air bombardments. The effect of these bombardments, while not producing great material damage, must be accounted as a decisive factor.

In the employment of armament the most outstanding points were: the British static use of tanks; the effect of antitank guns; and complete utilization of field artillery mobility.

The only notable achievement of the German Luftwaffe was their ability to maintain a protective fighter-umbrella for several hours during the withdrawal of motor transport through the minefields, despite over-all Allied air superiority.


EL ALAMEIN
September 9, 1942
disposition of units
2 0 2 4 6 MILES
All Elevations in Feet
LEGEND
MINE FIELD
GERMAN LINE
BRITISH OPERATION
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Deir El Abyad
El Mireir
Alam Baoshaza
Alam El Helfa
Alam El Dihmaniya
Deir El Hima
Qare El Abd
Deir El Qattara
Deir El Agram
Deir El Tarfa
Deir El Muhafid
Deir El Munassib
Mirbat Aza
Ragil
Gaballa
Himeimat
El Taqa
Brescia
Trieste
Ariete
90LT
Littorio
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382
433
3-33 Rcn Gp
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CORRECTIONS

From time to time errors may occur in Tactical and Technical Trends. In the interest of accuracy, corrections will be published when considered of sufficient importance. It will be appreciated if those errors noted by readers are brought to the attention of the Dissemination Group, Military Intelligence Service.

* * *

a. No. 12, p. 7

Reference was here made to a Japanese three-barreled 25-mm antiaircraft gun, and it was stated that although reported as 25-mm, the gun was possibly the standard 20-mm. Captured ammunition has definitely shown the caliber to be 25-mm. The propellant charge is a good deal larger than that of the 20-mm ammunition and the range is believed to be considerably greater. The 20-mm has a horizontal range of 5,450 yards and a vertical range of 12,200 feet. This three-barreled pom-pom, while a weapon of the Japanese Navy, can also be used ashore.

b. No. 14, p. 48

It was here stated that a 3-days' food supply for a Japanese paratrooper included, among other things, "Rice--2 kg - 250 grams (21 lbs 4 oz)." This was an error in conversion, as 2 kilograms - 250 grams is the equivalent of about 4.9 pounds.

c. No. 16, p. 23

It was here stated that in night combat Japanese fire could not be accurately returned because they used "flashless powder." It is true that the Japanese 38 year (1905) pattern rifle shows no flash when fired at night. However, this is caused not by the flashless properties of the powder but by the long barrel (31.5 in), which results in the complete combustion of the powder before it reaches the muzzle. The smaller powder charge and lighter bullet combine to give a lower muzzle velocity which also helps to eliminate flash. Flash is present in Japanese machine guns, carbines, and short rifles because some still-burning powder is blown out of the muzzle of these shorter-barreled weapons, proving their powder is not actually flashless.

UNCLASSIFIED

[redacted]

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BY

MILITARY
INTELLIGENCE SERVICE
WAR DEPARTMENT

UNCLASSIFIED

CONTENTS

[redacted]

All correspondence pertaining to the bulletin should be addressed to the Dissemination Group, M.I.S.

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For copies of these publications, apply to the Dissemination Group, Military Intelligence Service, Washington, D. C.

* * *

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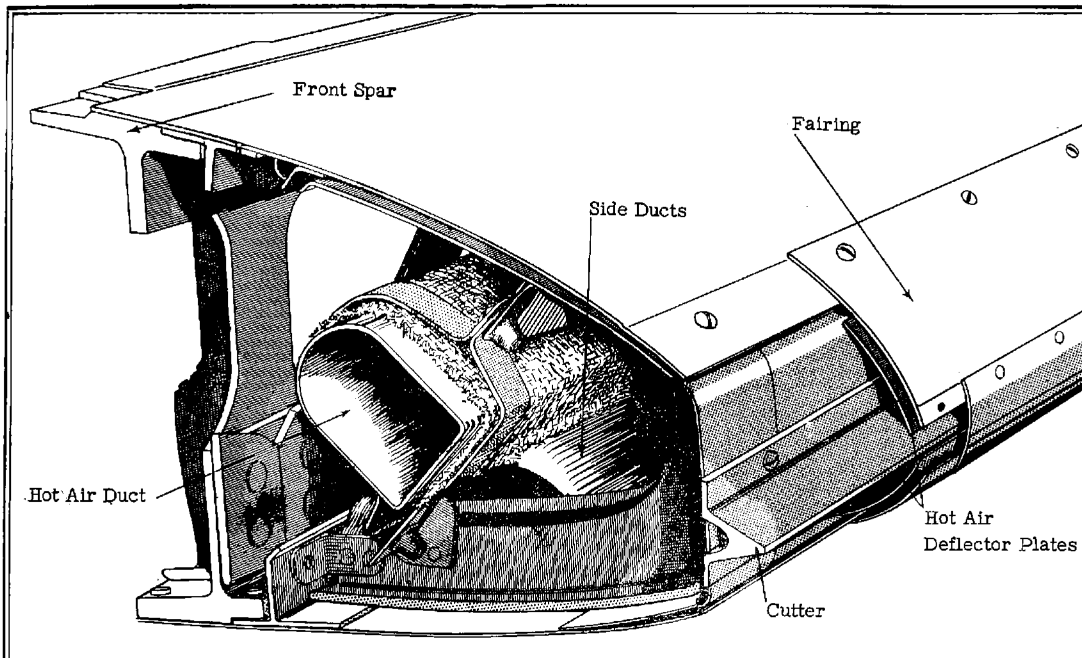
SECTION I

AIR

1. THE GERMAN CABLE CUTTER

Balloon barrages equipped with steel cables, which are used to protect industrial and military areas in the British Isles, and used to some extent in Egypt, present formidable obstacles to German fighters and bombers. These barrages are both fixed and mobile, and are capable of effective operation at considerable altitudes. In numerous instances, they have damaged the wings or fuselage to such an extent as to cause the enemy planes to crash or force-land on British territory. Avoidance of these barrages can be effected by flying over them, but this reduces the accuracy of level bombing. There are other means of avoiding balloon cables.

To cope with the situation, the Germans have developed knife-edge cutters called Kutonase which are fitted to the leading edge of the wings, and sometimes around the nose of the fuselage. They are made of steel, and the blade is suitably faired.



LEADING EDGE OF DORNIER WING, FITTED WITH KUTONASE

Three different types of Kutonase have been examined and tested. On the Ju-88 it was applied to a standard wing, the cutter having a hardened edge, covered with a thin sheet of duralumin forming the wing leading edge.

On the Dornier 217E, the wing in front of the spar had been specifically designed to take the cutter. The general design is similar to that on the Ju-88, but the cutter is of rolled steel instead of being fabricated, while the adverse effect of the fairing on the cutting is minimized by the insertion of a strip of thinner material along the fairing immediately over the cutting edge.

The Kutonase found on a Heinkel 111 was of an overshoe type, designed to be fitted to aircraft already in service, the complete unit being held in position by straps anchored to the front spar, and covered with doped fabric. In this case, the only material interposed between the cutter and the cable was doped fabric, but the advantage of this is probably decreased by the additional stiffness provided by the turned-in edges of the metal fairing. The cutter plate and mounting were similar to those on the Ju-88.

It is believed that the Kutonase on the Dornier 217E provides complete protection against heavy balloon cables at speeds over 200 mph but is effective against light barrage wire only at a considerably higher speed. Although the type used on the He-111 is just as efficient as that used on the Dornier 217E, the former plane is not so well protected on account of its lower maximum and cruising speeds. The Kutonase of the Ju-88 appears to provide little or no protection in normal flight, but might be effective at the speeds obtained after pulling out of a steep dive.

ANTIAIRCRAFT

2. 88-MM ANTIAIRCRAFT GUN ON RAILWAY MOUNTING

A photograph has been received of the German 88-mm antiaircraft gun on a railway mounting (see Tactical and Technical Trends, No. 17, p. 5 for a report on German railway antiaircraft protection). The four arms of the gun platform have been very considerably shortened and bolted to a railway car of the "Hungarian low-sided flat" type through a bed plate. The gun shield has been retained, and all other details of the gun and mounting appear the same as on the regular gun. A square platform on either side of the car can be let down from the vertical to the horizontal to give additional room for the gun crew. The photograph shows the gun being used for the engagement of a ground target, firing at right angles to the line of travel of the train, but there is little doubt that it can also be used in its antiaircraft role. Owing to the length of the barrel, the gun would, of course, have to be traversed to correspond with the line of travel when the train is in motion. This form of mounting allows a complete 360° traverse and freedom of elevation.

ANTITANK

3. GERMAN DEFENSIVE TACTICS IN RUSSIA

The following report contains German conclusions on certain phases of their defensive tactics as used in Russia.

* * *

a. Tanks should be kept in reserve. They should attack the flanks of enemy armored units as soon as the direction of the enemy attack is clear.

b. Defiladed antitank positions are highly desirable. Antitank guns should not open fire until approaching enemy tanks are at point-blank range. However, fire should be brought to bear under all circumstances, even though there appears to be little chance of success. The enemy tank will be slowed down, and will usually swing away. Antitank guns must be highly mobile so that they can be massed at any point where the enemy tanks are attacking. An allotment of half-track vehicles to antitank units is highly desirable to aid in obtaining cross-country mobility.

c. Concentrated artillery fire has a good harassing effect on enemy tanks.

d. Russian tank attacks are usually accompanied by infantry. German infantry which was passed by the tanks had great success against Russian infantry following the tanks. Therefore, all available means should be used to combat "tank shock." Experience has shown that German infantry when Russian tanks passed through them suffered only slight casualties when they were in "dug-in"

positions. For this reason it is essential that foxholes be dug deep, and at once, by every means available.

4. NEW GERMAN 75-MM ANTITANK GUN

With the increasing potential effectiveness of the tank, particularly in more powerful armament and greater armor thickness, there has of necessity been a corresponding development in antitank weapons. Perhaps the greatest threat to the tank is the antitank gun. Until recently the largest caliber German antitank gun (as differentiated from the AA/AT gun, or the tank gun) has been the 50-mm. It is now believed that the Germans have a 75-mm antitank gun, the 7.5-cm Pak 40. This is probably the long-barreled tank gun of the new Mark IV German tank, produced as a field piece. The importance of this development cannot be overestimated, since guns of the 50-mm class may thereby be rendered obsolescent. A further stage in the gun - vs. - armor battle may have been reached.

5. NEW AXIS SELF-PROPELLED GUNS

Owing to the battlefield mobility of tanks, as well as to other factors, the towed antitank gun is not always an adequate antitank weapon. To supplement the towed gun, self-propelled antitank guns have been developed and organized into special units: for example, the U.S. tank-destroyer organizations. For a considerable period of time the Germans have shown a tendency to mount a large number of guns on self-propelled mounts, the calibers varying from 20 mm to 150 mm. Recently the following new German equipment of this type was reported to exist:

German 37-mm AT gun on an armored personnel carrier;
Russian 76.2 -mm gun on German Mark II tank chassis;
Russian 76.2-mm gun on Czech light tank (38) chassis;
German 75-mm tank gun (40)* on German Mark II tank chassis;
German 75-mm tank gun (40)* on Czech light tank (38) chassis.

Of the above weapons, the first two are known to have been present in North Africa. Whether the last three have been issued to units is not known. The Germans are also reported to be developing 88-mm and 128-mm armored self-propelled guns.

The Italians are apparently still endeavoring to follow the Germans in the development of self-propelled weapons. It is reported that they now have a 90-mm self-propelled gun. While this gun is known to exist, it is not believed to have appeared yet in action. The Italian 75-mm self-propelled gun (see

*(See article number 4, this issue)

Tactical and Technical Trends, No. 6, p. 35) is reported to have proved not wholly successful, and it is thought that Italy does not possess sufficient resources to allow free improvisation on the German pattern.

ARMORED FORCE

6. RUSSIAN EMPLOYMENT OF TANKS

Soviet tactics, like German, are modern in character and show mastery of the entire gamut of weapons in modern war.

The following report deals with various items of information received from the Russian front, and is based mainly on articles which have appeared in the Russian Army newspaper "Red Star." No reference is made specifically to any particular phase of the Russian offensive.

The Russians declare that one of the main lessons of the campaign has been that armored forces alone can never achieve a decisive result; they must receive adequate support from other arms, and particularly from infantry, while they can never hope even to break the crust of a really strong position without the assistance of artillery or heavy bombing. The other arms are essential to deal with enemy artillery, antitank guns, and minefields. Moreover, even if tanks do penetrate a position, when unaccompanied by infantry they can be cut off and successfully dealt with, especially by night. The morale of seasoned troops remains entirely unaffected by the knowledge that isolated tanks are in their rear, for they realize that, provided the enemy infantry can be prevented from joining up with them, the tanks must either retire or be mopped up.

The Russians emphasize that armored vehicles must be concentrated to attack where they can be most effective. If they are supporting infantry they must be put under command of the unit supported, but the temptation to split them up into small groups with the object of helping the infantry forward all along the front must be avoided. Tanks should not be regarded solely as a means of direct attack to overcome strong resistance which is holding up the infantry, but should aim rather at breaking in where resistance is weaker, striking strongly defended localities only in the rear, and ultimately exploiting the "break-in" into a "break-through."

Tank forces in the attack must be accompanied by mobile field and antitank guns, which must be well forward to deal with surprise opposition. They will also be invaluable for repulsing enemy tank counterattack. Russian tank forces rely largely on air support, particularly by dive-bombers, to extend the range of artillery preparation, to harass enemy reserves, and to break up counterattacks.

7. NEW GERMAN TANKS

Several new types of German tanks have been reported to be in existence.

a. Mark I (C)

No details are known but it is probable that this is a redesigned Mark I intended for airborne or landing operations. The original Mark I tank weighed about 6 tons.

b. Mark II Special

The original Mark II tank (weight about 9 tons) has for some time been considered obsolescent as a combat tank. The new tank probably has thicker armor and a more powerful engine. One of the most important features is that it is reportedly armed with the long-barrelled 50-mm gun which is used in the new Mark III tanks. The result should be a comparatively light, fast tank with adequate striking power, probably suitable for use as a tank destroyer.

c. Mark VI

This is a heavy tank. No details other than the actual nomenclature are known, but it seems probable that this model is an entirely new departure in German tank design. It has been anticipated for some time that the Marks III and IV might be superseded by a new type incorporating the best features of each model and introducing features borrowed from British and possibly American designs. Having obtained a tank gun of first quality in the long-barrelled 75-mm tank gun (40), the weapon mounted in the new Mark IV tanks, it is probable that this weapon or an 88-mm weapon is the principal armament. The basic armor may be as thick as 80 or 100 mm, and spaced armor, at least in front, is probably incorporated. There may also be skirting armor. Face-hardened armor is probably used, and the speed is not expected to be under 25 mph.

Reports of a German heavy tank have been received over a considerable period of time. Apparently the most recent is the statement of a German captured in Tunisia. According to the prisoner, he belonged to an independent heavy tank battalion, which consisted of a headquarters company and two armored companies. Each armored company was equipped with nine 50-ton tanks. The tanks were armed with 88-mm guns and were capable of a speed of 50 kilometers (about 30 miles) an hour. Whether or not this is the Mark VI tank is not known.

ARTILLERY

8. ITALIAN PARACHUTE ARTILLERY EQUIPMENT

A number of prisoners of war from an Italian parachute artillery unit have revealed the following details of their equipment.

The type of parachute used is known as the "I.F." (Imbracatura Fanteria) which opens automatically. White parachutes are used for personnel. Jumps were made during training from heights varying between 800 and 400 feet. No jump is ever made from a lower level than 300 feet. One of the prisoners described a jump in which seven men had to leave the aircraft in 4 seconds. They were trained to launch themselves from the aircraft with arms and legs spread-eagled. The types of aircraft employed during training were the Caproni 133 (tri-motored transport type) and the Savoia-Marchetti 82 (tri-motored transport type).

Each man is stated to carry the following equipment: a haversack containing 40 hand grenades, a Beretta machine-carbine with 400 rounds of ammunition strapped to the right leg, and 3 days' iron rations and 1 quart of water. Mention was also made of revolvers and daggers, but the scale of issue was not stated.

The uniform appears to consist of an officer-type blue-gray tunic with lapels and large breast and side pockets, skiing-type trousers, and high black leather ankle-boots with toecaps and a rubber sole and heel in one piece. (This is not worn in North Africa.) The normal Italian steel helmet is worn, with a special lining and a neck protector. For protection when landing, gloves and knee pads are worn. An insignia consisting of a sword with a single wing is worn superimposed on the usual artillery collar patch, and a yellow parachute design is worn on the left upper arm.

Forty-seven-mm guns and ammunition are dropped in separate loads, by means of blue-colored parachutes, in special canvas sacks called Aero Rifornitori or Sacci Rifornitori. These sacks bear different markings which indicate their contents:

Gun barrel	Yellow flag
Ammunition	Red circle
Wheels and trail	Blue circle
Carriage	Black circle

The ammunition is packed in specially lined metal boxes containing either 4 or 8 rounds. The prisoners were uncertain as to the actual number, and were not able to say how many boxes were dropped in each sack.

CHEMICAL WARFARE

9. JAPANESE FLAME-THROWER*

A Japanese portable flame-thrower, captured by American forces in Bataan, is described below. The weapon is of excellent design and construction, although considerably heavier than the corresponding American type. The valve of the gun is awkward to operate. The mechanism for positive ignition is a distinct advantage. A desirable feature is that the flame-thrower operator can operate the valve of the pressure cylinder, but the Japanese method of doing this by means of a flexible shaft is considered undesirable as the shaft is heavy and easily kinked.

a. Pressure Tank

The pressure tank (capacity, 350 cubic inches) is 6 inches in diameter and has an over-all length (with valve) of 16 inches (see accompanying sketch). It has welded joints and is of light construction. To work properly it should have an initial pressure of 300 to 400 pounds per square inch. It is fitted with small couplings to secure it to the two fuel tanks. In the aperture at the top is fitted a handwheel-operated needle valve. Copper tubing connects the pressure tank to the left-hand fuel tank. The pressure tank is filled with compressed nitrogen.

b. Fuel Tanks

The two fuel tanks are of the same diameter as the pressure tank, but being taller have 25 percent greater capacity. The tanks are connected by two welded tubes, one near the top and the other near the bottom. These act as pressure and fuel channels and as joints. As mentioned above, the left-hand tank is joined to the pressure tank by copper tubing. This tubing is connected to a needle valve of which the operating handwheel is on a flexible shaft 1 foot long and coming over the shoulder of the operator. The right-hand tank is fitted on top with a 1-inch filling cap. About two-thirds of the way down its right side is the hose connection. An interior tube insures emptying the tanks. The lower connecting tube or channel allows the fuel in the left tank to empty out. The upper channel insures an equal pressure on both tanks regardless of the position of the tanks or the amount of fuel remaining in each.

c. Connecting Rubber Hose

The hose which connects the nozzle to the fuel tanks is made of 1 1/2-inch reinforced fabricated rubber tubing. It is 45 inches long and has brass fittings on both ends.

d. Fuel Nozzle and Ignition Mechanism

The fuel nozzle and ignition mechanism has an over-all length of 47 inches.

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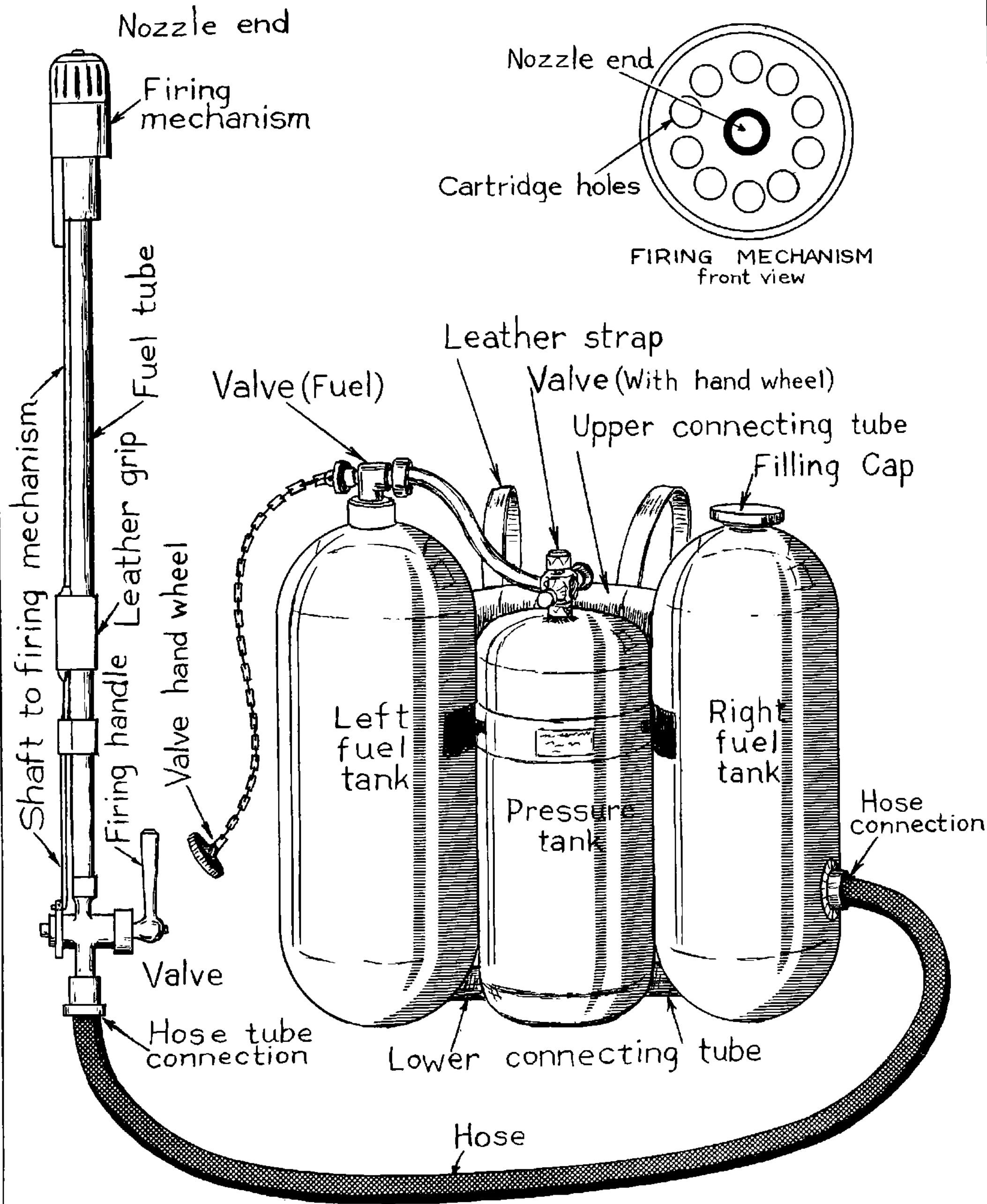
*Prepared in the office of the Chief of Chemical Warfare Service.



JAPANESE FLAME THROWER

At the hose end, the tube is 1 inch in diameter and tapers down at the nozzle end (where it passes through the ignition mechanism) to one-quarter of an inch. The ignition mechanism depends on the firing of a .43-caliber blank cartridge into the stream of fuel. The nozzle, fitted in a 2 1/2-inch by 5-inch cylinder, contains the firing mechanism. Within the perimeter of the cylinder are ten .43-caliber holes to hold the blank cartridges. The cylinder revolves on a cam operated on each stroke of the firing handle. The firing handle is on the handle end of the nozzle, and is connected to the firing mechanism by a metal shaft. When the firing handle is turned, it performs a two-fold function. It fires the blank cartridge under the firing pin, and at the same time closes off the fuel by shutting off the valve in the handle. This prevents the flame from reaching the tanks in case of a flare-back.

e. Operation

The leather straps which enable the apparatus to be strapped on the operator are fixed to the two connecting tubes of the fuel tanks. The tanks are filled with coal tar, thinned down with hydro-carbons, and then a filled pressure tank is attached. The operator opens the pressure-tank valve, thus putting pressure on the fuel-tank valve. The apparatus is strapped on with the fuel-tank valve handwheel and shaft carried over the left shoulder, and the hose and nozzle under the right arm. The operator releases the fuel by turning the handwheel of the fuel valve. The stream of fuel is played on the target, and then the firing handle is turned, firing one cartridge which ignites the fuel. It is estimated that the flame-thrower has a range of about 30 yards. It is capable of firing a continuous jet of fuel for 10 to 12 seconds.

ENGINEERS

10. MINEFIELDS IN NORTH AFRICA

The report which follows is the result of British experiences in one of the campaigns in Cyrenaica, as indicated in a British document. Minefields played an imporant part in this fighting.

a. In Consolidation

Until such time as antitank mines can be brought forward in bulk by night, the early consolidation of a newly captured position can be very greatly strengthened by the laying of a limited number of mines in order to restrict the probable avenues of enemy approach. An armored vehicle in engineer units is desirable for this purpose, though its design offers considerable difficulty, since it must resemble other armored vehicles in the vicinity and still have an adequate carrying capacity (two diametrically opposed characteristics).

b. Records

The campaign in question proved once again the paramount importance of minefield records, and it is clear that this problem received insufficient attention. Casualties were reported as resulting from the absence of records on the location of British antipersonnel mines, and the records kept of the numerous antitank minefields were often far from complete.

c. Marking of British Minefields

It should be noted that the majority of British casualties caused by British antitank and antipersonnel mines were due to carelessness with respect to the marking of the fields and notification of their presence. For this problem, no solution has been found either by the British or by the enemy, whose minefields are often marked by the wrecks of their own vehicles, and the vicinity by the graves of their own men. One difficulty was that there was no standard system of marking the minefields. One of a number of systems suggested was that in rear areas they should be marked with tin triangles painted black and hung on barbed wire, supported on either long or short stakes; it is essential that the stakes be placed firmly in the ground. In forward areas, a 2-inch white tape has been suggested, over-printed every yard with a black triangle and supported on short stakes; the tape would be issued with the mines from the advanced railhead, or packed in each box of mines at the base. The quantities of supplies involved would be considerable.

The decision as to whether minefields should be marked rests with the commander, who should realize that what denotes a minefield to friendly troops may also disclose its presence to the enemy.

d. Clearance of Enemy Minefields

In attacks on fortified enemy positions, mine detectors were used with success, through some difficulty was experienced in their operation in the noise of battle. In addition, they cannot, of course, be used under actual shell fire or aimed small-arms fire. There would appear to be a call for a type of detector with a visual indicator which can be operated from within a tank.

The best method of clearing minefields is still neutralization by hand under cover of darkness. Where mines have to be dealt with during daylight, the operation must be covered by smoke. On the enemy side of the main obstacle, when all surprise had been lost, a gelignite cordtex net was used for clearing lanes for the tank advance.

In one area, as a deliberate operation, 70,000 antitank and antipersonnel mines were cleared, and 100 miles of warning fence were erected; all this was done by 3 field companies in 25 days. Eighty percent of the mines cleared were laid by the enemy, and all had been subjected to shell fire and blast over a long period. Casualties during the 25 days were 16 killed and 13 wounded. This was

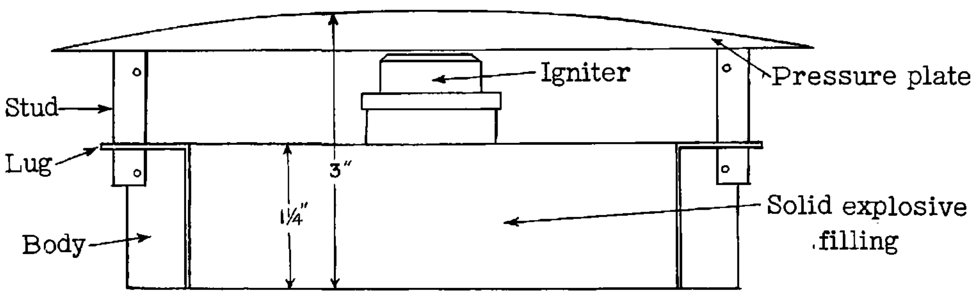
considered a very fine piece of work under the circumstances.

11. ITALIAN VARIABLE-PRESSURE MINE

a. General

The accompanying sketches show details of the Italian circular variable-pressure mine. This can be used as an antitank or antipersonnel mine. The following information has been obtained from an examination of a captured specimen.

The body of the mine consists of a circular steel container, 8 inches in diameter and 1 1/4 inches deep. The explosive filling, weighing 3 1/2 pounds, is similar in appearance to impure TNT and is wrapped in black waxed paper.

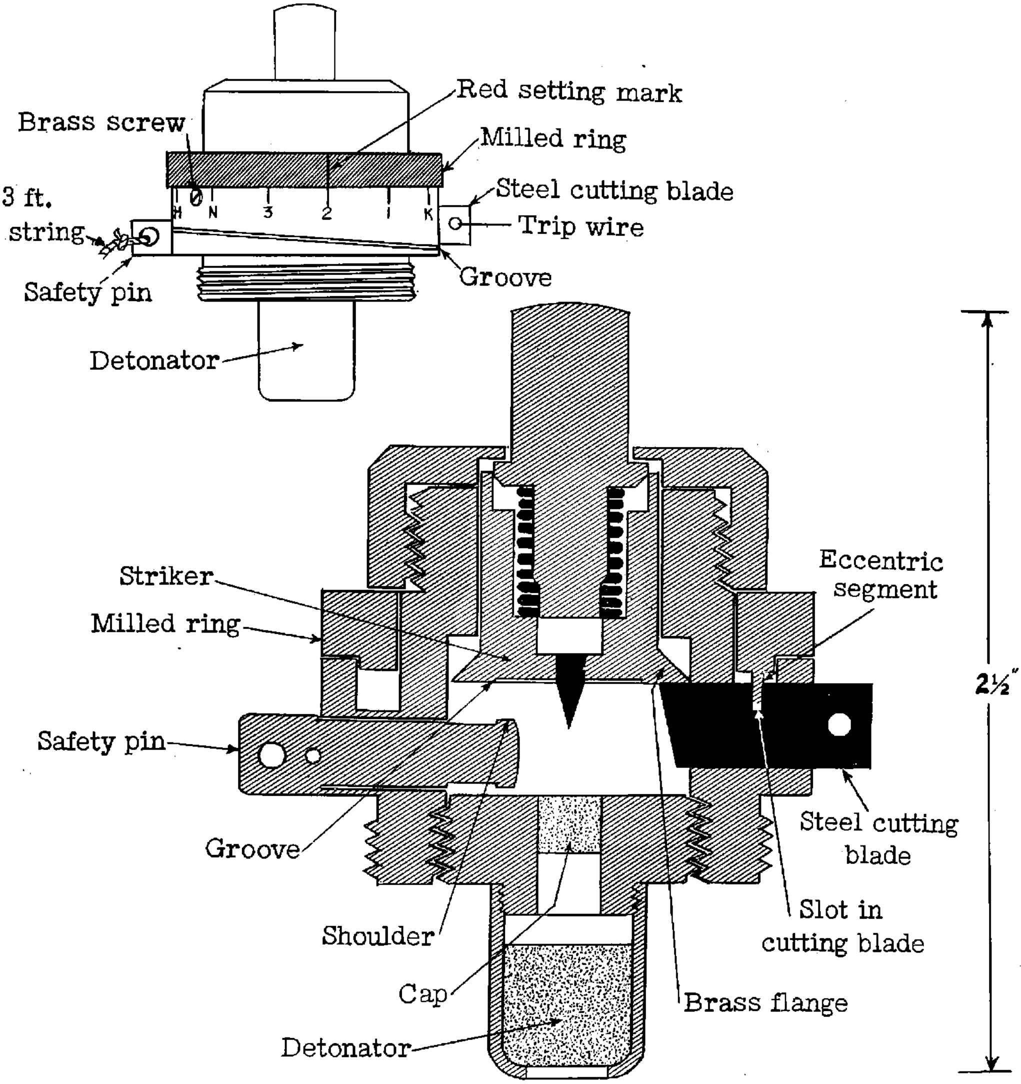


Into the top of the body screws the brass igniter, incorporating a spring-loaded striker which is retained by the hardened-steel cutting blade. A brass cylindrical safety pin, with 3 feet of cord or string attached to its outer end, is prevented from falling out, or being accidentally withdrawn, by a piece of twine passing through a hole in the safety pin and secured in a groove around the body of the igniter.

A steel pressure plate, 10 inches in diameter and slightly dome-shaped, rests on the top of the igniter and has three studs equally spaced on its circumference. These fit into the holes in three lugs welded to the outer edge of the mine body, and are secured by cotter pins passing through the lower of two holes, 1 inch apart, in each stud. The mine is painted black, and its total weight is 8 pounds. The over-all depth of the armed mine is 3 inches.

b. Functioning of Igniter

Pressure on the head of the igniter causes the steel cutting blade to cut through the brass flange on the base of the striker, which then moves under the influence of its compression spring to fire the cap situated above the



IGNITER — ITALIAN VARIABLE PRESSURE MINE

detonater. Since the flange takes the form of a truncated cone, the pressure required to operate the igniter may be varied by varying the depth of cut. This is effected by means of an eccentric segment on the underside of a milled ring. The segment projects into a slot in the cutting blade, and when the milled ring is rotated the cutting blade is inserted or withdrawn. A red setting mark on the outer edge of the milled ring indicates the setting of the igniter on the scale on the igniter body. This scale has the following significance:

K represents a firing pressure of 35 kilograms (77 lbs) (lowest setting)
1 represents a firing pressure of 100 kilograms (220 lbs)
2 represents a firing pressure of 200 kilograms (440 lbs)
3 represents a firing pressure of 300 kilograms (660 lbs)
N represents a firing pressure of 350 kilograms (770 lbs) (highest setting)

The rotation of the milled ring is limited in one direction by a stop, and in the other by a brass screw.

If the brass screw is removed and the setting mark set at "H," the eccentric segment is withdrawn from the slot in the cutting blade and, by attaching a wire through the hole in the cutting blade, the igniter can be made to function as a trip mechanism.

If the striker should be released prematurely while setting the igniter, a shoulder on the safety pin engaging in a groove in the base of the striker prevents the withdrawal of the safety pin.

c. <u>To Disarm the Mine</u>

(1) Look for a trip wire and if one exists cut it without exerting any pull on the cutting blade;
(2) Remove the pressure plate;
(3) Insert a pin of between 1/8 inch and 3/16 inch in the safety pin recess to a depth of not less than 5/8 inch;
(4) If the igniter has been set as a trip igniter, press home the cutting blade;
(5) Unscrew and remove the igniter from the mine;
(6) If the mine is required for further use repack it as described below.

d. <u>To Arm the Mine</u>

(1) <u>To Arm as a Pressure Mine</u>

(a) Remove the pressure plate.

(b) Set the igniter to the desired firing pressure by turning the milled ring until the red setting mark is opposite the required

graduation. Then screw the igniter into the mine and stretch out along the ground the safety pin withdrawal cord.

(c) Replace the pressure plate and insert cotter pins or wire through the bottom holes in the studs.

(d) After emplacing the mine, withdraw the safety pin.

(2) To Arm as a Trip Mine

(a) As above.

(b) Remove the brass screw and turn the milled ring until the red setting mark is opposite the graduation "H." Screw the igniter into the mine and stretch the safety pin withdrawal cord along the ground. Attach a trip wire through the hole in the cutting blade.

(c) As above.

(d) As above.

e. Method of Packing

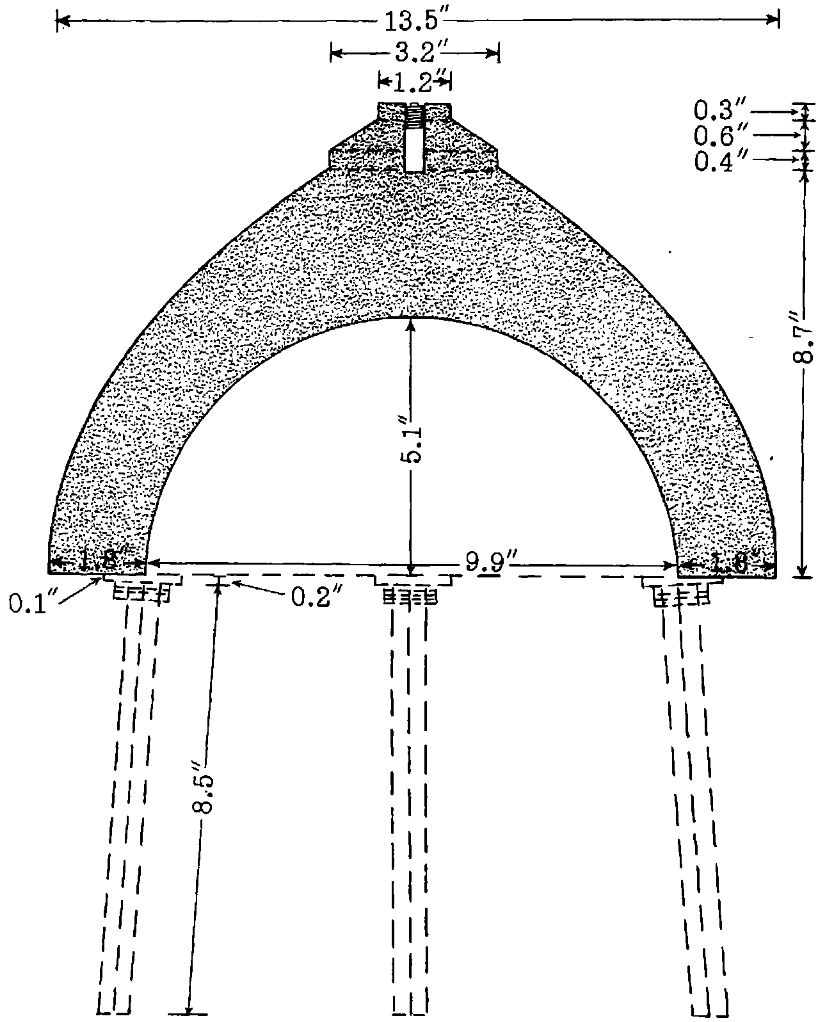
(1) As issued by the manufacturers, the igniter is replaced by a wooden plug which is screwed into the mine body. The pressure plate is then fitted on top, resting on the wooden plug and held in place by cotter pins or wire passed through the upper holes in the studs of the pressure plate. The igniters are carried separately in a steel container, 8 inches in diameter and 2 1/2 inches deep, partitioned radially to carry six igniters. Each container also holds three igniter tools.

(2) Slits in the pressure plate of the mine and slots on the side of the igniter container, which correspond exactly, lead to the belief that six mines and one igniter container are packed one on top of the other, with a strap or steel band passing through the slits and slots clamping all seven together.

Remarks: Mines so far encountered have been laid with their pressure plates flush with the ground. It is believed that in theory the mine should be buried to a depth of from 2 to 4 inches.

12. GERMAN HOLLOW DEMOLITION CHARGE

Specimens of a new type of demolition charge (see accompanying sketch) have been captured in the Middle East. It is designed to perforate steel cupolas in fortifications. While generally similar to the "bell" demolition charge described in Tactical and Technical Trends, No. 3, p. 22, an important difference is that this charge has three folding legs; these are provided to support the charge at a certain distance from the armor to be perforated. The weight of the charge is approximately 30 pounds.



German Hollow Demolition Charge.

It does not appear that these charges are normally carried by divisional engineers; they are probably held in reserve and issued for special tasks.

INFANTRY

13. GERMAN TACTICS--RUSSIAN FRONT

The following report deals with the experiences of the German Army on the Eastern Front. The extracts are taken from two documents issued by The German War Office, one dated March 1, 1942, and the other August 1, 1942.

* * *

a. Attack

The special nature of the Russian Front, with its great area and few roads, has led to a tendency when on the march to cling too much to existing roads. The Russians have based their defensive system on these roads. The best attack is that made off the roads, using enveloping forces which must be made as strong as possible. Where possible, artillery should be allocated to these enveloping forces, but in most cases they will have to depend for their fire power on the heavy weapons of the infantry, especially the heavy mortars. Even weak enveloping forces may achieve decisive results by surprise attack, coordinated with the main frontal attack.

The fighting in the Kerch Peninsula has once more shown that deep slit trenches, and well-built earthworks, often render impossible the destruction of the enemy by artillery, infantry support weapons, and by bombing; these, as a rule, serve only to make the enemy keep his head down. Infantry in the attack must, therefore, approach as closely as possible behind the artillery barrage, and attack with all possible speed as soon as it is lifted.

The Russians have shown themselves very susceptible to a section or platoon assault in close formation, carried out with shouts and firing on the move.

Night attacks have been found to be of special importance on the Eastern Front, since it is the Russian practice to carry out moves at night, and these attacks prevent the enemy from carrying out his plan.

b. Coordination of the Various Arms

On the Russian Front our success in the coordination of the various arms has been due to the careful organization of the fire plan of all weapons down to those of even the smallest units. The infantry must learn not to rely exclusively on artillery fire, or the support of tanks or assault guns, but must use its own heavy weapons to the fullest extent.

The main task of the artillery is counterbattery missions, and all available forces will be concentrated against the enemy's artillery "schwerpunkt" (area in which enemy artillery is concentrated) without regard to corps or divisional boundaries.

Assault guns must never be used without the protection given by accompanying troops. They require infantry protection since, as they have no revolving turret and little protective armor, they are incapable of close defense.

c. Defense

Russian reconnaissance is pushed without regard to losses. Limited attacks for purposes of reconnaissance, are, as a rule, carried out mostly by a company, but may be made by a battalion. When the weak spots are thus found, the enemy maneuvers his main forces, which are usually masses of infantry supported by tanks. The attack is preceded by intensified mortar fire, and shelling by tanks at extreme ranges. If the leading tanks are shot up and the first attack beaten off, a pause of several hours often precedes the second attack.

The rule for defense in open country, when ammunition is plentiful, is to open fire at great ranges; when the country is not open and ammunition is scarce, it is more effective to let the enemy approach, and then strike him with sudden concentrated fire at long range.

Defense on a wide front is the rule on the Eastern Front, where only the most important points can be occupied. These are to be built up as strongpoints, and occupied with one or more platoons, with heavy weapons (heavy mortars, heavy machine guns, and antitank guns). All-around defense must be organized. When the strongpoints are far apart, greater patrol activities between them will be necessary.

d. Antitank Defense

Russian tanks seldom attack in large numbers. As a rule a few, sometimes even single, tanks precede the attacking infantry, which then follows in compact groups. In defense, therefore, the most important task of all arms is to separate the infantry from the tanks. The aim of infantry training in antitank defense must be to teach the young soldier that the effect of tanks against dug-in riflemen is extraordinarily limited. Fighting against tanks is, for the infantrymen, merely a matter of nerves.

The plan for antitank defense should ensure that 50-mm antitank guns are brought into position in good time, because of their lack of mobility; 37-mm antitank guns may be held on carts under cover, or near prepared positions, since these guns are more mobile.

e. March Discipline

The few and very bad roads in the east have necessarily had heavy

traffic, and a column moving on the roads is liable to become very extended. Therefore, troops following up require more time than usual, and it is necessary to put well to the front of the column considerable detachments of artillery and heavy weapons, and communications and engineer personnel. Similarly, to ensure the supply of a column, carefully calculated loads of ammunition, fuel, and lubricants must be included at intervals along the road.

f. Night Fighting

In night attacks all units must be given definite and limited objectives. Detailed and careful planning is the basis of success, and considerable previous reconnaissance is required. The results of this reconnaissance form the basis of the commander's plan, which must be known down to its smallest details by every junior commander.

A useful means of keeping direction at night is the preliminary setting of fire to haystacks or houses in enemy territory.

g. Mobile Troops

Fighting over wide, open areas and along roads has often made necessary the formation of mixed battle groups in which tanks have been included. As a consequence, the number of tanks decreased rapidly and the units from which they were detached lacked the necessary strength to carry out independent attacks. An armored division equipped with a tank regiment of three battalions and motorized infantry is capable of extensive tasks, provided its tanks are kept concentrated, and the motorized infantry is directed to cooperate closely.

In defense the most successful method of stopping a breakthrough of enemy mobile troops or tanks is the formation of mobile groups reinforced with antitank and close-support weapons; they should be disposed in depth throughout the sector, particularly in localities vulnerable to tanks. These counterattack groups are to be held ready to attack the flank or rear of any enemy force which may break through and to cut off the enemy rearward communications.

h. Miscellaneous

For all infantry weapons, in particular the machine gun, mortar, and antitank gun, a wide field of fire is not so important as emplacement to produce a heavy uninterrupted belt of fire to the immediate front.

On the Eastern Front, unnecessary losses have been caused by unmilitary behavior, both at headquarters and in units, in zones covered by enemy fire. Considerable casualties, which could have been avoided, have been caused by the disinclination of the German soldier to dig in quickly in the course of the battle, his carelessness behind the immediate front, and by inadequate battle reconnaissance of invisible areas.

14. BRITISH NOTES ON A CAMPAIGN IN CYRENAICA

The Middle East Theater has peculiar topographical and climatic conditions, and the conduct of military operations depends to a considerable extent on these important factors. Care must be observed in drawing general conclusions based on the tactics employed in one area, since the measures invoked may have local application only. The particular campaign treated here was in Cyrenaica as reported in a British document.

a. Consolidation of Position

Security against counterattack by enemy tanks will depend on the speed with which objectives can be consolidated. Consolidation is an operation in which all arms are concerned, and the proficiency required can be attained only by constant practice with a definite method to insure that it is carried out instinctively and without waste motion. There is no reason why a battle drill for consolidation should interfere in any way with selection of the best ground from a tactical point of view.

b. Deception

The study of this subject has, in the past, been neglected. Experience has shown that:

(1) Efficient deception measures may produce results out of all proportion to the effort in personnel and materiel expended on them.

(2) Staff officers must have a full knowledge of the potentialities of deception, and it must be considered in all operational planning.

(3) It cannot be effected on short notice; considerable preliminary organization and development are necessary.

(4) Large-scale deception normally involves a heavy call on administrative resources and equipment. Once it has been agreed that it is justified, full priority must be given to the scheme. Half measures are ineffective.

c. Penetration and Countermeasures

In certain operations there were occasions when strong forces, both enemy and British, penetrated to the extent of seriously threatening communications. When operating on wide fronts with dispersed forces this threat will always exist, and preparations must be made accordingly. Armored car patrols should be detailed to maintain contact both by day and night with any enemy columns which penetrate, and strong mobile reserves suitably located should be held for the protection of vital points.

15. SCOUTS AND OBSERVERS

The following report on scouts and observers is based on a lecture given by a British officer at the Commando school.

* * *

The object of scouting should be to obtain accurate and reliable information in all types of warfare, whether stationary or mobile, in all types of country, with or without the aid of maps, binoculars, and other such instruments, for the information of the commander which cannot be obtained in the normal way by other troops.

Scouts are specialists, and must reach a considerably higher standard of training in their specialty than do other troops. In addition, they must have a knowledge of the functions and organization of other arms, and must keep up with recent developments. Scouts must be keen, resourceful, and trustworthy, and must cultivate reasoning powers. Surprise and mobility are the greatest assets of scouts. It is the duty of every scout to learn all he can about his job and about the function of other arms, by constantly being observant and taking an intelligent interest in all he knows or sees around him.

The importance of gaining superior observation over the enemy cannot be overestimated. "No Man's Land," whether it be a hundred yards or a hundred miles broad, must be kept under continous observation, and regarded as a network through which no piece of information, however small, must be allowed to escape. For this reason, duties of scouts are the same although methods may be different.

A trained scout or observer, having acquired a knowledge of infantry soldiering, should be an expert in: observation and use of binoculars, map reading, writing of reports, use of compass, patrolling, concealment and use of cover, selection and construction of observation posts, use and care of weapons, and identification of the various arms. In addition, it is desirable that he should have a knowledge of field sketching, drawing plans, the study of air photography, and first-aid. He should also be able to ride a horse and a motorcycle, swim, cook, and sail a boat. A high standard of physical fitness is also required.

The various roles in which scouts are invaluable are:

(1) Patrols, observation in small detachments, sniping, and verbal reporting;

(2) Fieldcraft--if necessary to the extent of being able to pass through enemy lines;

(3) All scout personnel must attain a high degree of skill in movement by night over difficult country by use of stars and compass, and must be trained to carry out certain tasks under cover of darkness, and in silence;

(4) Construction of field defenses, and erection of obstacles;

(5) Demolition and sabotage.

For the above, scouts must not only be physically fit, but must have 100 percent self-confidence. There are more occasions in the role of a scout where a cool head, a clear eye, and a quick imagination win through, than in any other branch of military warfare.

MEDICAL

16. SCHISTOSOMIASIS*

In some localities throughout the world (see map at end of book), bodies of fresh water such as lakes, rivers, streams, swamps, ponds, irrigation ditches, and flooded rice fields may harbor the larvae or cercariae (young forms) of various blood-worms or flukes. Human infestation with these flukes is known by the terms schistosomiasis or bilharziasis. The only type found in the Western Hemisphere (Caribbean Islands and South America) is the variety which produces intestinal lesions and dysentery and is known as intestinal bilharziasis. In certain regions of Africa these flukes produce a condition known as urinary bilharziasis, though the intestinal form also is present. Heavy areas of infection are found in Egypt and in some of the oases of the North African desert. In parts of the Far East, notably Japan and China, an intestinal variety is known as oriental bilharziasis. The geographical distribution of these diseases is shown on the map referred to above.

The cercariae or young forms of these flukes are harbored by certain species of fresh-water snails. When the parasites leave the snail host and are discharged into the water, the survival time of the cercariae is less than 48 hours unless another suitable victim is found. These cercariae may enter the body through the unbroken skin of swimmers, bathers, or persons wading in such waters, or through contaminated drinking water that has not been boiled or sufficiently treated with chlorine. If water for bathing is stored in a clean container and is free of snails, it will become entirely safe for use in 48 to 72 hours. This will not insure water satisfactory for drinking purposes.

One should be extremely cautious in wading, bathing, or swimming in fresh-water ponds, streams, lakes, or rivers which have not been examined and found to be safe by Army medical officers or others competent to judge. Salt-water bathing and swimming, except at beaches near the mouths of fresh-water streams or near city sewage outlets are safe and do not constitute health hazards.

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*Prepared in the Office of the Surgeon General.

ORDNANCE

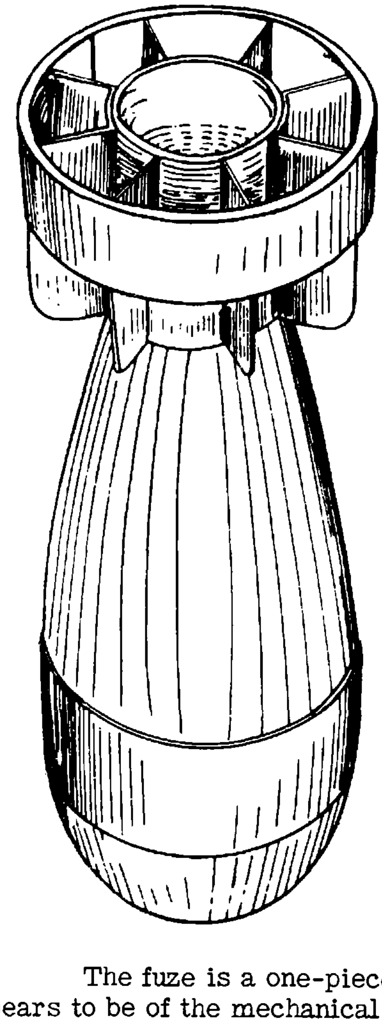
17. GERMAN ANTICONCRETE SHELL

While the fighting on the Russian Front has tended to consist chiefly of the fluid operations of open warfare, permanent and semipermanent fortifications have also played an important role. Faced with the necessity of reducing fixed defenses, the Germans are reported to have begun, comparatively recently, to produce a special design of shell to destroy concrete. So far as is known at present, reliance is placed on the unusual design of the nose of the shell and upon the build-up of the detonation. This shell, which carries the abbreviated nomen-

clature "Be," is reported to exist in 150-mm and 210-mm calibers. It is probable that there are other types for use with artillery weapons which would normally be expected to destroy fortifications.

18. NEW GERMAN ANTIPERSONNEL BOMB

A new type of antipersonnel bomb, weighing from 2 to 3 pounds when filled and complete with fuze, is reported to have been recovered in the Mediterranean area and is shown in the accompanying sketch. It is presumably German, since the bomb casing is very similar to the 50-mm mortar bomb.



The following details are available:

Length of body	4 1/4 in
Maximum diameter of body	2 in
Diameter of body at nose	1 3/8 in
Diameter of body at tail	1 in
Over-all length with fuze	6 3/4 in
Length of tail	1 1/4 in
Diameter of tail	2 in
Number of fins in tail	8
Nature of filling	TNT
Bomb and tail painted	yellow

The fuze is a one-piece aluminium fuze screwing into the nose and appears to be of the mechanical impact type.

19. AMMUNITION FOR GERMAN 100-MM CHEMICAL MORTAR

A recent report describes this as a single-barreled chemical or smoke mortar (Nebelwerfer), which in essential details is similar to the 81-mm mortar, though larger. The actual caliber of the weapon is 105 mm. An HE shell and two types of smoke shells are known to exist.

a. HE Bomb 10-cm Wurfgranate 37

This shell is conventional in appearance and design. Fitted with a nose percussion fuze, its internal arrangements are similar to those of the usual HE shell. Immediately below the fuze is a booster, which is contained in a steel holder screwed into the nose of the shell. A small smoke box is situated below the booster. The shell is gray-green in color.

The following are the main dimensions:

Weight of shell . . . . 16 lbs
Weight of bursting charge . . . . 3.75 lbs (TNT)
Length of shell . . . . 17 in (approx)
Diameter, across body . . . . 4 in (approx)
Diameter, across tail fins . . . . 4 in (approx)

b. Smoke Bombs 10-cm Wurfgranate 35

The existence of two types has been established from the examination of German documents. The internal arrangements appear to be similar to those for the standard types of German smoke shell.

Both types of shells are fitted with a nose fuze and both have a central tube containing a bursting charge of picric acid. It can be assumed that there will be a booster fitted underneath the fuze. One of the shells is reddish-brown in color and has "Nb" stencilled on the body, while the other is gray-green in color and has "Nb St" stencilled on the body.

c. Propelling Charges

The propelling charges consist of a primary charge and four auxiliary charges. The primary charge, which consists of 17 grams of ungraphited black powder, is contained in a blue-colored cartridge with a black primer color. Each auxiliary charge weighs 21 grams and is contained in a silk bag. These charges consist of a double-base propellant containing nitro-glycerine and having the following dimensions:

External diameter - 3.5 in (approx)
Internal diameter - 1.75 in (approx)
Thickness - 0.4 mm

The following system is used by the Germans to denote charges:

Charge 1 (Erste Ladung) - primary charge;

Charge 2 (Zweite Ladung) - primary charge plus 1 auxiliary;
Charge 3 (Dritte Ladung) - primary charge plus 2 auxiliaries;
Charge 4 (Vierte Ladung) - primary charge plus 3 auxiliaries;
Charge 5 (Fünfte Ladung) - primary charge plus 4 auxiliaries.

The shells are issued one to a container, and the total weight of shell and container is 20.75 pounds.

20. GERMAN ROCKET WEAPONS

There has been considerable speculation on German rocket weapons. While there is no doubt as to the existence of such weapons (it is thought that they have been used on the Russian Front), not a great deal is known as to how they are used or how effective they may be. The Germans have tried to surround this type of weapon with the maximum of secrecy and horror. However, according to the reported opinion of a senior Russian officer who had encountered them, the Russians apparently feel that they are not an effective weapon.

German rocket weapons have already been discussed in Tactical and Technical Trends. For purposes of convenience, brief mention is made below of all German rocket weapons so far reported.

There are two main types of rocket weapon, one of which is fired from a frame (see this publication No. 8, p. 28) and the other from a six-barrelled rocket projector (see this publication No. 10, p. 23 and No. 17, p. 38). The frame type reportedly exists in three models: a wooden frame, a steel frame, and a frame carried on the side of an armored personnel carrier. All are used to fire the same rocket projectile. There are also three models of the six-barrelled projector: 150-mm, 210-mm, and 280-mm. The 280-mm projector fires the same projectiles as those fired from the frames; it is reportedly six-barrelled, but this has not been confirmed.

The German nomenclature of these weapons is as follows:

Frame Type

Schweres Wurfgerät 40 (wooden)
Schweres Wurfgerät 41 (steel)
Schwerer Wurfrahmen 40 (on armored personnel carrier)

Projector Type

15-cm Nebelwerfer 41 (six barrels)
21-cm Nebelwerfer 42 (six barrels)
28/32-cm Nebelwerfer 41 (believed to be six barrels)

21. AXIS HOLLOW-CHARGE AMMUNITION

As previously reported in Tactical and Technical Trends (No. 4, p. 21) the Axis armies are using hollow-charge ammunition. This is armor-piercing ammunition with an explosive charge or filling and is designed to pierce armor at relatively low muzzle velocities. The Germans consider that it achieves reasonably good armor penetration with little loss of antipersonnel fragmentation.

The Germans are known to have at least 3 types of hollow-charge ammunition, all caliber 75-mm and designated as follows:

7.5-cm Pz. Gr. Patr. 38 KwK,
7.5-cm Gr. 38,
7.5-cm Jgr. 38.

The first type is used in both the short- and long-barrelled 75-mm tank guns; presumably this ammunition could be used in the new 75-mm antitank gun (7.5-cm Pak 40) discussed in this issue in article number 4. The second type is designed for the 75-mm light field gun 18, and the third type for the 75-mm infantry gun.

The Italians also are reported as having developed hollow-charge ammunition. They are known to have three types, 75/18, 75/27, and 100/17. The 75/18 is designed for the Italian 75/18 (caliber 75-mm, length of bore 18 calibers) gun - howitzer, the 75/ 27 for the standard 75-mm light field piece, and the 100/17 for the 100-mm mountain howitzer.

The 75/18 weapon exists in two models: model 34 and 35. Model 34 is a mountain gun; model 35, which has a more heavily constructed carriage, is used as a field piece and a self-propelled armored mount (see Tactical and Technical Trends, No. 6, p. 35).

22. DESTRUCTION OR SALVAGE OF ENEMY MUNITIONS

British experience in North Africa has shown that, before an advance is made, a plan must be drawn up for the salvage or destruction of enemy munitions. If destruction is decided upon, action should be completed as soon as possible after capture.

Engineer salvage units should be in possession of the following information before an advance is started:

(1) Types and calibers of munitions to be salvaged;
(2) Munitions to be destroyed;
(3) Munitions required for examination.

In spite of the absence of a complete plan in one of the North African

campaigns, it is learned that 4,000 tons of bombs were destroyed by engineering units during the course of a withdrawal. On one occasion 300 tons of high-ex plosive bombs, of which 50 percent were 110 pounders, 40 percent 550 pounders, and 10 percent 1,100 pounders, were collected in 1 day into 2 groups, each of 4 dumps, from various parts of an airdrome 1,000 yards in diameter, by 70 men using 8 trucks with tow-ropes. The demolition charges were laid in 3 1/2 hours, and firing took three-quarters of an hour.

23. DESTRUCTION OF ABANDONED VEHICLES

When motor vehicles must be abandoned, it is essential that they be rendered useless to the enemy. To this end the Germans recommend that the following steps (among others) be taken.

When the time is limited and the vehicle must be rendered useless quickly, the carburetor, distributor, and fuel pump should be destroyed. Hand grenades are effective for this purpose, especially when placed between the carburetor or distributor and the cylinder block. According to the Germans, a grenade placed in this position will crack the cylinder block. When there is sufficient time for more deliberate action, the distributor, generator, starter, and tires should be destroyed. Gasoline should then be poured over the vehicle and ignited. In the case of tracked vehicles, 3-kilogram (6.6-pound) charges should be placed between the driving sprocket and the front bogie wheel on each side of the vehicle, and exploded.

24. GERMAN SALVAGE OF CAPTURED MATERIAL

The importance of captured material in the German supply system is emphasized by Field Marshal Rommel in an army order issued to his troops. The order states that the shortage of raw materials and supplies in Africa makes it necessary to take every opportunity of seizing enemy equipment and supplies. Units may take with them only such amounts of captured material as will not impair their operational readiness; all other booty is dealt with by a special Salvage Section (Beuteberge-Abteilung) of Panzer Army Headquarters.

A guard is to be left over all dumps and stocks and Headquarters is to be informed of their location. The Salvage Section will make arrangements for the security and removal of all dumps and will provide technical personnel and transport. It is to be in direct communication with the forward troops, and will include a salvage platoon from Air Headquarters. Captured supplies are to be marked in light blue paint with the words "Tedesco," Italian for "German" and Erfasste Beute (captured booty). Strong disciplinary action is taken in the event of any misuse or destruction of salvage.

QUARTERMASTER

25. GERMAN RATIONS IN LIBYA

The following German food and water situation in Libya has been reported as a result of PW interrogations. The information showed that until July 1, 1942, no food or water difficulties had been experienced in the unit concerned, and after the fall of Tobruk canned fruit and vegetables had been added to the normal rations.

The battalion rations officer was responsible for the collection of rations (requisitioned every 3 days by companies) from the supply dumps, and for the delivery to companies. For distribution to companies there were four 3-ton trucks, never loaded to more than half capacity. Thus for 3 days' supplies, a 6-ton truck capacity per battalion was necessary. Bread was collected separately from the field bakery. Apart from the regular 3 days' supply, companies carried 6 days' and each man 1 days' iron rations. Rations included one hot meal each day, always prepared in the field kitchen, which is brought as far forward as possible.

Rations per man per day actually issued were:

Coffee	Bread	Water *
1/2 oz real coffee	1/2 lb at rest	About 5 pints at rest
1/4 oz substitute	1/3 lb in battle	About 3 pints in battle

*Drinking and cooking water, including water for tea and coffee .

SIGNAL CORPS

26. ITALIAN PARACHUTE SIGNAL FLARE

A specimen of an Italian parachute signal flare has been captured by the British in North Africa.

a. Description

The flare is contained in a cardboard tube (1) (see accompanying sketch) 0.19 inch thick, which, in the specimen examined, was colored bright red. The tube is provided with a corrugated cardboard grip (2), 3.9 inches long. Below this grip the tube is pinched in to fit into the groove in the wooden plug (3), and is secured by a wire (4). The open ends of the tube are sealed by paper, gummed over the ends at (5) and (6). The plug (3) has a central hole which contains a friction igniter (7), consisting of a match composition pellet attached to the end of a short length of cord and secured by a tack (8). The

free end of this cord string (9) is protected by the seal (5). A part of the cord (10) near the igniter pellet (7) is impregnated with phosphorus. At (11) is a short length of safety fuse which forms a 2-second delay and leads to the powder charge (12). Above this is the candle (13) and its parachute (14), which are secured in place by a felt washer (15) and a length of waste packing (16).

b. Method of Functioning

When the seal (5) is broken, and the free end of the string (9) pulled, the part of the cord at (10) is drawn through the hole in the plug (3), where friction between it and the pellet (7) ignites the latter, which fires the safety fuse (11). After 2 seconds delay, this ignites the powder charge (12) which expels the candle (13) and parachute (14).

c. Handling

If the ends of the tube are sealed, the flare has not functioned and is safe to handle. If the lower seal is broken, the cord should be secured within the end of the tube so that it cannot be pulled accidentally. The flare should be destroyed by burning.

GLOSSARY

27. BRITISH TERMS USED IN RELATION TO ARMOR

ANGLE OF IMPACT

This is the angle between the plate and the line of flight of the projectile on impact.

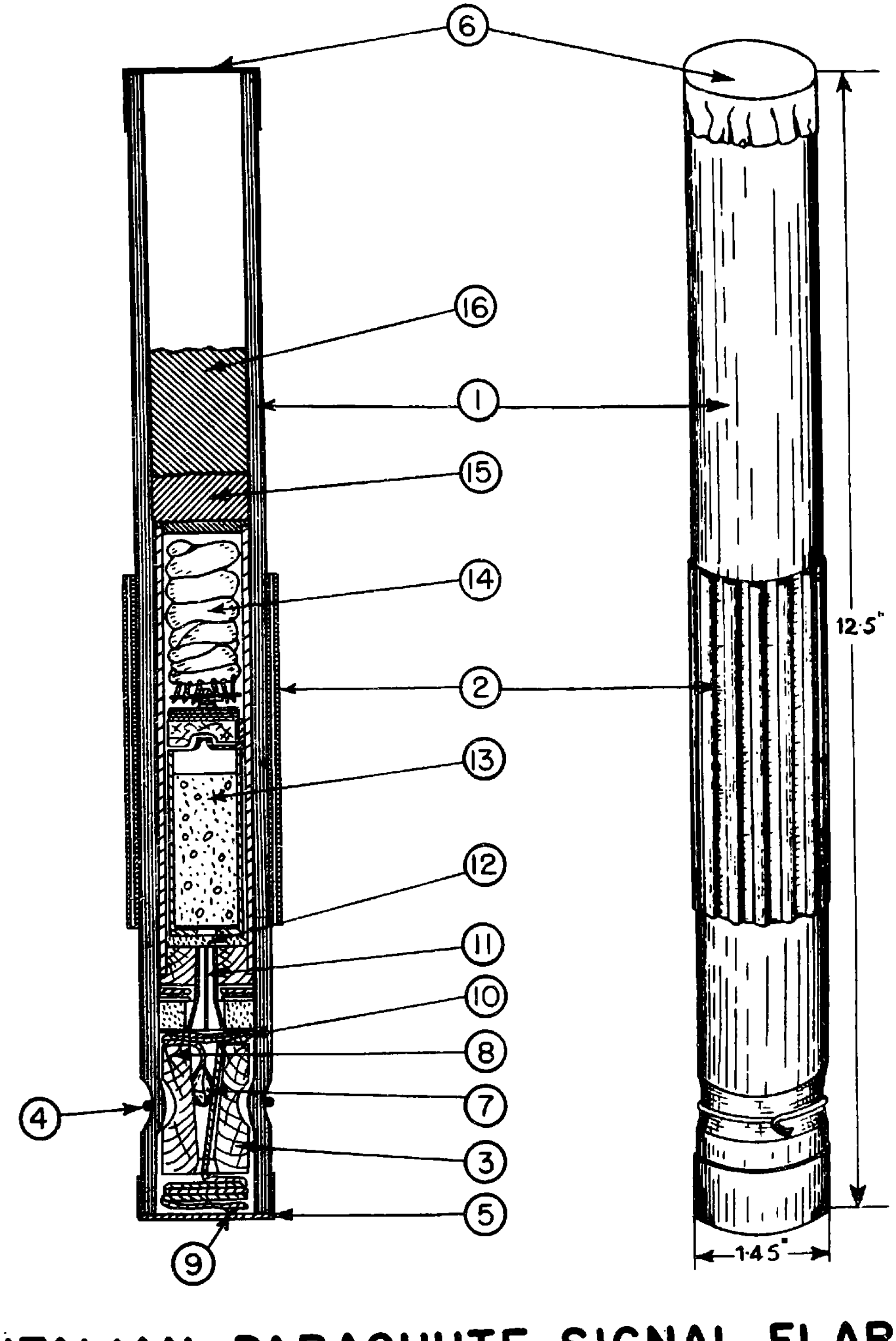
In the British and American Armies, this angle is measured from a line at normal (perpendicular) to the surface; some foreign countries, including Germany, measure it from the plane of the plate. Thus 30° British or U.S., equals 60° German.

At 10° to 15° angle of impact, the reduction in AP performance of a projectile is generally small compared with normal impact, but beyond about 20° the reduction is increasingly marked, and must be taken into account; 30° angle of impact is used for proof of all AP projectiles in Britain.

GERMAN AP 40 (Pzgr.40) (Sketch No. 3)

A special type of AP ammunition used with most German tank and antitank guns in addition to the more conventional types of AP projectile.

The AP 40 projectile consists of a mild steel body, a light alloy or plastic ballistic cap, and a cemented tungsten carbide core. The weight of this type of projectile is only about 50 percent to 65 percent that of the normal AP



ITALIAN PARACHUTE SIGNAL FLARE

shell. The muzzle velocity is high, but the velocity falls off rapidly with increasing range, so that increased penetration is obtained at short ranges only.

ARMOR-PIERCING CAP (Sketch No. 1)

A hard steel cap fitted to AP projectiles to assist in penetrating face-hardened armor.

A projectile so fitted is known as " APC." All modern German AP projectiles of 50 mm and over have a piercing cap; in calibers of 75 mm and over it is of blunt shape, making a ballistic cap necessary.

BALLISTIC CAP (Sketch No. 2)

A long and pointed cap fitted to a projectile to reduce the air resistance in flight. (Where both AP and ballistic caps are fitted, the projectile is designated APCBC).

In the case of normal AP projectiles, the presence of a ballistic cap, although in itself slightly impeding penetration, actually increases it at medium and long range due to the reduced deceleration caused by air resistance, and the consequent higher striking velocity.

BRINELL NUMBER see HARDNESS

CARBURIZING (also known as cementing or case hardening)

The process of increasing the carbon content of the surface of steel by heating the metal in contact with carbonaceous material.

This enables the surface to develop a much greater hardness than the interior when the carburized steel is heat-treated. In "gas carburizing," a gas rich in carbon is used instead of a solid material. See also CYANIDING.

CASE HARDENING (see CARBURIZING above)

CEMENTING (see CARBURIZING above)

CYANIDING (see CARBURIZING above)

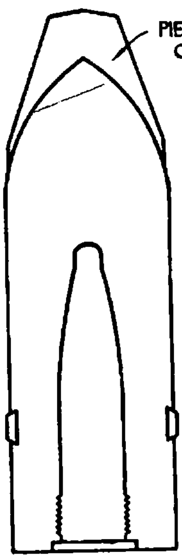
Another process of carburizing in which the metal is heated in a molten bath of sodium cyanide and other salts.

DISKING (see FLAKING and DISKING)

FACE-HARDENED ARMOR

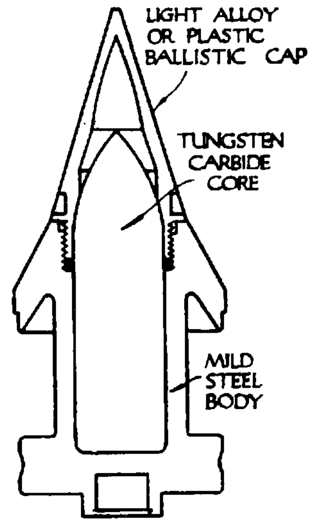
Armor with a hard face, but tough base.

ARMOR PIERCING PROJECTILES

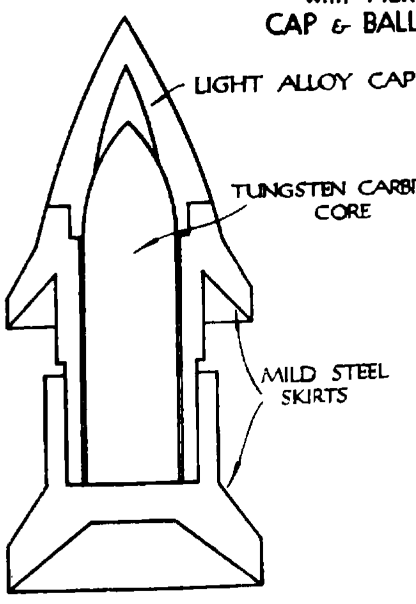


1. A.P. SHELL WITH PIERCING CAP.

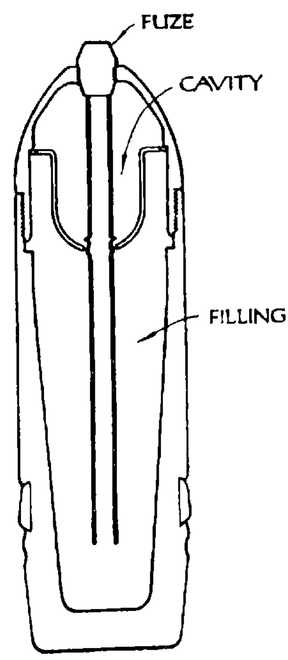
2. A.P. SHELL WITH PIERCING CAP & BALLISTIC CAP



3. A.P. 40 SHOT



4. GERLICH TYPE PROJECTILE



5. HOLLOW CHARGE SHELL

This armor is usually made by carburizing one surface of the plate so that this surface becomes much harder than the body of the plate when the plate is heat-treated. Face-hardened armor may also be produced by flame-hardening.

FLAKING OR DISKING

Terms used to describe the type of plate failure which is accompanied by an approximately circular piece, of much greater diameter than the projectile, coming off the back of the plate. It occurs when the plate has insufficient shearing strength in a direction parallel to its surface. Flaking or disking is dangerous in single-skin armor.

FLAKE-HARDENING

A face-hardening process which consists in using an oxyacetylene flame to heat the surface layer of metal above the critical temperature, and then quenching rapidly by a spray of water falling behind the flame.

GUERLICH PRINCIPLE (Diagram No. 4)

This principle involves the use of a tapered-bore barrel and a skirted projectile, the skirts of which are squeezed down as the projectile travels through the bore. A high-muzzle velocity is obtained by the use of a light projectile with a large effective base area at the commencement of shot travel. It is a means of obtaining a high armor-piercing performance without necessitating a heavy weapon. Owing to the relatively light weight of the projectile, this performance is obtained at short ranges only. The thickness of armor penetrated is considerable in relation to the weight of the gun. The hole made is, of course, small. Barrel wear is high.

German antitank guns so far known to be working on this principle are the 28-mm tapering to 20-mm (see Tactical and Technical Trends, No. 5, p 14), and the 42-mm tapering to 28-mm (see Tactical and Technical Trends, No. 7, p 3). The projectiles for those two guns have a tungsten carbide core.

HARDNESS

The hardness of a material is its resistance to deformation.

Various systems are employed for measuring hardness, including the Brinell, Vickers Diamond, and Rockwell systems. The Brinell number of a given specimen is derived from the diameter of the impression obtained by pressing a steel ball on to the surface of the material.

HOLLOW-CHARGE SHELL (Diagram No. 5)

A type of shell with a shaped cavity in the forward end of the HE filling.

The effect on impact is to concentrate a jet of blast in a forward direction. The underlying principle is to pierce armor by blast perforation, instead of the projectile forcing its way bodily through the armor by its weight and striking velocity. The penetrative power of hollow-charge AP projectiles is therefore independent of the striking velocity. Their use in low-velocity weapons, such as howitzers or infantry guns gives these weapons an improved performance against tanks, within the limits of their accuracy.

HOMOGENEOUS ARMOR

Armor which has approximately the same composition and hardness throughout its thickness.

HOMOGENEOUS HARD ARMOR (HOMO HARD)

A homogeneous armor of a hardness too great to be conveniently machined by ordinary commercial methods; i. e., of a Brinell harness greater than 400, usually 440 to 480.

IMMUNITY THICKNESS

The thickness of plate specified as providing protection against a given attack. When the plate is up to the average in quality, this figure is usually the thickness that will so withstand the specified attack that the bulge caused at the back of the plate is uncracked.

IZOD NUMBER (see TOUGHNESS)

MACHINABLE QUALITY ARMOR (MQ)

A homogeneous armor sufficiently soft to be machined by ordinary commercial methods; i. e., of a Brinell hardness less than 400.

PANZERGRANATE (Pzgr)

The German generic term for all types of AP projectiles, whether shot or shell, capped or uncapped.

PETALING

This is said to occur when metal displaced on perforation forms a ring of petals round the hole in the plate. With thin plates, petals are formed on the back only. With thick plates, they may form on the front as well. Petaling is the most desirable type of back damage on penetrated plate, since with perfect petaling, none of the armor is projected into the vehicle, as is the case when the penetration of the plate is accompanied by flaking or plugging. There are, however, intermediate conditions under which the petals formed on the back during penetration do not remain attached to the plate.

PLUGGING

A plug is said to be formed when the pressure of the head of the projectile causes the separation by pure shear of an approximately cylindrical plug of the plate metal. Next to petaling, it is the least undesirable form of failure, since less metal is projected into the tank than with flaking.

SHELL

A projectile having a cavity which may be filled with HE, smoke, or chemicals, and generally fitted with a fuze.

SHOT

A solid projectile.

SPACED ARMOR

When two or more plates are used with a space between them, the arrangement is known as "spaced armor."

There is little data on the effectiveness of spaced armor. It has been stated that the space should be greater than "the length of the projectile plus one inch." The shot may then be tipped while passing through the outer plate and turned in the space, thus striking the rear plate sideways and being stopped by it. This effect is likely to be more pronounced at oblique attack, for at normal the shot may sometimes keep straight and so penetrate the rear plate. A smaller gap may, however, be effective if the projectile shatters during its passage through the outer plate, as would appear to be the case with projectiles having tungsten carbide cores, or if the outer plate is face-hardened.

TOUGHNESS

The toughness of a material is its capacity to absorb energy before fracturing. It is commonly measured by the Izod Impact Test in which a notched bar test piece of the material is held in a vice and then broken by a heavy pendulum. The Izod value is the energy in foot pounds required to break the test piece and is calculated from the continued movement of the pendulum before commencing to swing back.

Toughness and hardness are largely opposing properties, the relation of which has to be balanced if a satisfactory ballistic performance is to be obtained.

SECTION II

GERMAN ATTACK UNDER COVER OF AREA SMOKE SCREEN

GERMAN ATTACK UNDER COVER OF AREA SMOKE SCREEN

The following translation of portions of a German manual gives some guiding principles for carrying out attacks in which area smoke screening is employed as an integral part of an operation. The term "area screen" is employed to mean the use of smoke to cover an extensive area so as to produce conditions resembling those effected by a thick natural mist. (See Tactical and Technical Trends, No. 6, p. 16, for certain details about the tactical use of smoke by the Germans.)

* * *

a. General

Artificial smoke - used for area screening - is an important aid to an attack against an enemy prepared for defense on a stable front, in field works, or behind water obstacles.

The employment of area screening depends on the plans of the superior commander, the strength of the front to be attacked, the topography, and the weather conditions. In an attack on a wide front, the screening may be limited to a particular locality.

It creates a zone of decreased visibility in which and into which observation, and hence observed fire, is rendered either difficult or impossible except at the closest ranges. It therefore favors close combat. Given this chance, the attacking troops close with the enemy. Some units utilize gaps in the enemy's fire, disorganized by the smoke, to achieve a breakthrough; at the same time other units attack and neutralize those enemy islands of resistance that might hold up the breakthrough. In this way the attacker pushes his way through the entire depth of the hostile battle position.

The attack under the cover of smoke, with a constantly changing visibility, demands initiative and resolution from the leaders of the smallest units and even from the individual soliders.

If the defender, ready in expectation of an attack, is blanketed by smoke, the resulting impossibility or difficulty of observation causes a material reduction in the effectiveness of his weapons. Hence, as long as the screen lasts, the defender's morale is subject to an ever-increasing strain.

Owing to the impossibility of maintaining observation in a battle waged in smoke, the superior commander of the defense will only be able to influence to a slight extent the course of the action. In an attack on a wide front this will seriously affect the commitment of enemy reserves. Without observation the planned defensive fire cannot be brought to bear with flexibility nor be maintained indefinitely. Organized control of fire will be quickly undermined. Gaps will inevitably appear in the curtain of fire. This will be the case particularly on a defensive front where the fire plan is based on enfilading cross-fire.

The attacking units must have available equipment which will enable them to maintain their direction in smoke, and they must be well trained in its use.

In order to reach assembly positions the use of smoke screens may be necessary. Area screening, however, should be reserved for the attack on the hostile battle position so as to enhance its effect by achieving surprise in its employment. Anything which will give the defender any indication, during the period of preparation, of the intended use of area screening must be avoided. The length of time consumed between reaching assembly positions and the beginning of the attack in the main battle zone is mainly determined by the scope of essential preparations, reconnaissance, the assembly of the attacking units and their ammunition, and the enemy counterattacks. In the case of limited local actions this will occupy at least one night. In the case of an attack on a wide front against a defensive position with permanent defenses, it may stretch over a period of several days.

The main objective of the attack lies in the enemy's artillery position.

As a general rule, area screening will not be employed beyond the rear edge of the hostile battle position. It may be advisable to blind the enemy reserve positions (i.e., by a smoke screen in the ordinary sense, which aims to curtain observation from one area into another rather than to reduce visibility <u>within</u> an area as does the area screen), and also in certain circumstances, the antitank defense on the far side of the battle position, as protection for the attackers as they emerge from the cover of the area screen.

If the hostile battle position is of great depth and strength, it may be necessary to decide upon intermediate objectives. Such a procedure makes it possible to coordinate the laying of the area screen with the progress of the attack. Only features of the ground easily distinguished in the smoke, i.e., roads running at right angles to the line of advance, intersecting streams, etc., are suitable as intermediate objectives.

The area screening is put down in zones 200 to 300 yards deep across the line of attack. The smoke will extend to adjoining areas by drift. Its rate of advance will be governed by the difficulties anticipated in the respective zones from the fighting and from the nature of the terrain. Two hundred yards every 15 minutes can be taken as a guide. A completely flexible control of the smoke screen - to suit the advance of the infantry - is not practicable. Once the screen has been set in motion to cover the ground to a particular objective, it must adhere to the time table laid down. The only possible change of the time table is at the point when the advance is resumed from one intermediate objective to the next.

In order to deceive the enemy, the screen must always extend over the flanks of the area of attack.

The area screen can only be put down by smoke units and artillery working together under the sole command of the artillery commander.

The area screen can be supplemented by the smoke equipment of the attacking units, such as smoke hand grenades, smoke candles (adapted for throwing), and smoke shells fired by the light and heavy infantry guns. For this purpose, it is essential that the attacking units be abundantly equipped, especially with smoke candles.

Rear areas of the battle zone which afford the enemy observation of the battle zone, but are outside the area screen, must also be blinded when the attack commences. Such additional tasks increase the number of smoke batteries and the munitions necessary, as does also a high wind.

Even though area screening is employed, the artillery must still carry out its chief task, namely to prepare the way across the battle zone for the attacking units and to give them the necessary fire support. The area screen supplements, but does not replace, HE bombardment with its destructive effect. The artillery must therefore be prepared to meet the unusual conditions. Since observation of the effect of artillery fire on individual targets is interrupted during the employment of the screen, the destructive artillery bombardment preceding the area screening acquires increased importance. The mixture of HE and smoke bombardment in the area screen makes it difficult for the infantry to orient itself and closely follow up the smoke.

Armored units can be and should be used in the attack; in the screened zone they must maintain the closest coordination with the attacking infantry. Their employment will be limited to the use of individual armored vehicles attached to attack groups for crushing nests of resistance.

b. The Attack

The following points relate to an attack on a wide front against a front provided with fixed works. They are also to be used in an attack against an enemy entrenched in field defenses or behind water obstacles.

The selection of suitable points of attack, and the time table on which the movement of the area screen depends, can only be based on careful preliminary planning. The attacking units themselves must have as clear a picture as possible of the particular ground and the defensive dispositions in their zone of attack; this is necessary in order to permit them to stage the attack in detail and to make proper use of their direction instruments, as well as to be able to reorient themselves, under the difficulties which arise when fighting in smoke.

An attack embodying the use of smoke should commence when the infantry is within assaulting distance. For this purpose, the ground leading up to the battle zone must be already occupied and cleared of obstacles and minefields, so that no lengthy delay will occur during the approach and the occupation of assault positions.

The attacking units are brought into position the night before the attack. In order to avoid undue exposure to enemy artillery fire, they may be assembled for the attack in rearward positions, providing the approach to the battle zone is adequately patrolled. Pathways and roads in the approach zone must be so marked that an unimpeded approach is assured even when smoke is present. The attacking units come up to the line of departure in open order, to lessen the effect of the enemy barrage. The early morning hours are the most favorable for the commencement of the attack.

The approach of the attacking units can be preceded by a fairly long area-screening bombardment - even intermittently - on the forward approaches of the battle zone, in order to give the enemy no clue as to H-hour; this will also cause him to disclose his defensive barrage and artillery positions. A mixture of smoke and HE fire can be maintained until the infantry attack approaches the region of the area screening.

The attacking force can make systematic use of area screening in a degree proportionate to the thoroughness with which the artillery has destroyed defensive works, obstacles, and mine fields, and cleared out the pockets of enemy resistance in the hostile outpost position prior to the launching of the attack. The HE bombardment should be put into operation early and to a large extent be maintained with intensity, if the troops have been drawn up into final assembly positions, in order that during this period, when they are more defenseless than the defender, they should not be exposed to increased enemy artillery fire. While the attacking units are deploying into attack position, the artillery should put down harassing fire on the hostile outpost position. The neutralization of enemy artillery becomes a factor of particular importance at this point. At the commencement of the attack under cover of the area screening, all artillery unengaged and not firing smoke opens up on counterbattery tasks so as to assist the assaulting troops to cross the zone of the enemy barrage. The enemy artillery should be kept neutralized throughout the further course of the attack. Part of the artillery should continue to engage such of the enemy positions in the hostile outpost zone as have not been covered by smoke.

When the infantry is nearing the rear edge of the battle zone, the artillery takes up the task of rendering the necessary fire support to the spear-head of the attack as it comes into view out of the smoke, either because of the thinning out of the area screen or because they have left its cover prematurely. At this point, HE bombardment must neutralize enemy forces debouching on to the far side of the battle zone and must hinder the bringing up of enemy reinforcements. For this purpose, provision should be made for rapidly moving forward a number of batteries.

Artillery forward observers with field telephones accompany the most advanced elements of the attacking infantry, with artillery liaison officers at infantry battalion headquarters. During the advance in the smoke, they signal to the observation sections at a pre-arranged time by means of "vertical light signals," to indicate the progress of the attack.

The commitment of the assaulting troops is done by individual assault groups at points where the defenses, obstacles, and terrain offer favorable conditions for a thrust through the hostile battle position.

During the battle, the assault groups must rely upon their own resources. Their strength should be such as to ensure that they will be able to fight across the battle zone over the whole of their allotted sector, and to reach the far side as units strong enough to continue active fighting. It is most important for the attack that full advantage be taken of the enemy's lack of observation. The thrust through the battle zone is based on the assumption that the defensive works will also be subjected to attack at the same time. In an attack on a battle position of considerable depth, the assaulting units are organized in groups which carry out the breakthrough, and into those which are intended simultaneously to attack the centers of resistance.

The division commander designates the objectives to the infantry commanders. He assigns the artillery its missions and, subject to orders from higher echelons, arranges the direction and timing of the area screen. He informs the infantry commanders of the plans of the artillery and smoke units, and puts under their command the necessary engineer units, and, if required, antiaircraft guns and armored vehicles. He must make every effort to see that the attack, after the hostile battle position has been broken through, is carried into the enemy artillery position without delay. He relieves the assault infantry of the responsibility of finishing off the defensive positions remaining unattacked between the assault groups.

The commander of the infantry regiment gives the assault battalions their battle orders and organizes their coordination. To this end, he indicates the direction of attack and the objectives. He attaches to the battalions, to enable them to carry out their missions, such further weapons as are necessary--antitank guns, infantry guns, direction indicators, and special weapons. His further influence on the progress of the fighting is exercised by the prompt use of his reserves at the points where the attack can best be pressed forward. After the breakthrough, he quickly reforms those elements of the regiment which have become scattered during the attack, so that they may again be used as a united whole.

The battalion commander splits his battalion in accordance with their missions. The troops assigned to carry out the thrust across the hostile outpost position must be prepared to overrun rapidly,or crush,the enemy troops occupying this zone. They should therefore be reinforced with heavy machine guns, reserve assault units, and, if the occasion requires it, heavy mortars and light infantry guns as well. The battalion commander tells them where to go and assigns guides to operate with them. Those forces which are sent out against the defensive works need, above all, engineer units with their specialized offensive equipment, individual armored vehicles, and weapons for the engagement of pillboxes. The battalion commander goes forward himself with the troops assigned to the main effort, i.e., the breakthrough, and is responsible for seeing that they succeed quickly in reaching the far side of the battle zone. There, he reor-

ganizes his companies to continue the attack.

Besides the coordination of individual armored vehicles during the attack against enemy field works, armored units, after the battle zone has been successfully crossed, should continue the attack by breaking into the enemy artillery positions; the enemy reserves also should be attacked in order to facilitate the reorganization of friendly infantry for further attack.

By clearing away obstacles and minefields, the engineers make it possible to push forward almost up to the enemy front lines, the line of departure for the final breakthrough. During an attack in smoke, engineer units are attached to the individual assault groups for special purposes, chiefly for the demolition of the stronger field works. Their strength is determined by tasks to be performed.

As the area overrun increases, it is important to clear paths quickly across the battle zone and to mark those on which reinforcements can be brought up in order to exploit fully the success of the attack.

During the attack through the smoke-covered battle zone, it is unlikely that there will be any danger from enemy tanks, and yet the rapid organization of an adequately strong antitank defense in the newly acquired line is necessary when the smoke cover is left behind, especially after the objective of the attack has been gained. Since the antitank guns needed by the assault groups for the engagement of loopholed defenses are, for this purpose, drawn from the companies of the infantry regiments, division antitank units are given the mission of screening as quickly as possible, against enemy tank attack, the infantry which has broken through the battle zone.

The lack of observation in the smoke-covered area makes necessary the extensive use of radio, even for lateral communication. When the far edge of the battle zone is reached, communications with the artillery must be established by all means available. The increased requirement for means of communication makes it clear that additional signal units should be provided.

The cooperation of the air force is desirable: at the commencement of the assault, dive-bombing attacks are made against enemy battery positions, and during the development of the attack, against the assembly and movement of enemy reserves. Reconnaissance aircraft are to be employed to observe the battle zone and the density of the smoke screen, and to reconnoiter the unscreened enemy rear area.

Reserves are to be held ready in such a position that the attack can be continued as far as possible without interruption until the objective of the attack - the enemy artillery positions - has been taken. After the objective has been reached by the assaulting units, larger units held ready for immediate use, especially armored divisions, are thrown in to develop the success already achieved into a full-scale breakthrough.

During an attack against an entrenched enemy position (without permanent fortifications), area screening is particularly effective in upsetting enemy defensive fire, since as a general rule it is not based on a rigid machine-gun fire plan. On the other hand, the attacker will have less information about the hostile dispositions and the effective zone of the enemy's fire than if he were attacking a permanent front. Under these circumstances, there will not usually be a grouping together of assault troops into special units.

In the case of an enemy defending behind a water obstacle, area screening is used as a general rule only where there is little or no current and the width of the stream is small. The peculiarities of smoke formation over an expanse of water (because of differences in temperature, etc.) must then be taken into consideration. The bringing up of ferrying equipment is carried out under protection of the smoke, which in the most densely smoked area should prevent observed fire or aerial observation of the crossing. The first wave should ferry over those attacking groups which will deal with the most forward positions commanding the water. The time table for the smoke barrage will consider the fact that the troops ferried across must assemble on the enemy bank before the thrust into the hostile battle position. If the strength of the current and width of the stream preclude the employment of smoke for the actual crossing, it may be practicable to employ area screening for the subsequent prosecution of the attack.

c. Direction Indicators for Attacking Units

Apart from the watch compass, the following are available for attacking units:-

(1) A radio beam--a transmitter and several receivers working in conjunction with it. The transmitter is set up at the line of departure, and lays a radio beam about 20 meters wide through the smoke in the direction of the objective. By using the receiver, one can check at any time whether he is on the radio beam, i.e., in the line of the attack, or has deviated to a flank. This equipment is mainly intended for the leading units of the forces carrying out the attack. Transmitter, receiver, and service personnel will be provided by a special communications unit. For such employment they are attached to the attacking unit.

(2) Direction shells which scatter colored powders (red, yellow, blue) are issued as special ammunition to the infantry gun companies. These rounds are fired before the commencement of the attack at intervals of about 50 yards along the path of the attack, which is thus marked by colored patches.

(3) Direction tapes about 300 yards long, one end of which is attached to a rocket fired in the desired direction. Direction can then be maintained by following the tape along the ground to its far end, from which point another tape-trailing rocket can be fired, and so on. This system is recommended chiefly for marking the direction of advance of the attack groups to the most advanced positions.

(4) The gyro-compass serves as a refinement of the watch compass. It is not deflected by metals (e.g., tank turrets), and can be set for the direction of attack.

(5) Direction tapes in various colors serve to mark paths taken by staffs or units through the smoke. They facilitate report traffic, the maintenance of contact, and the forward movement of units subsequently committed. Markings on the direction tapes give the troops an indication as to how far they have penetrated into the smoke from their starting point.

The employment of direction indicators, the allocation of the individual colors, and the necessary instructions to attacking units, must be clearly laid down in orders.

d. Influence of Weather, Wind, and Terrain

Every smoke operation is fundamentally influenced by weather, wind, and terrain.

(1) Weather

The weather is considered favorable when there is an overcast, little light, and cool temperature; hence, in general, the early morning and evening hours. It is unfavorable under conditions of intense solar radiation, intense heat, frost, and snow.

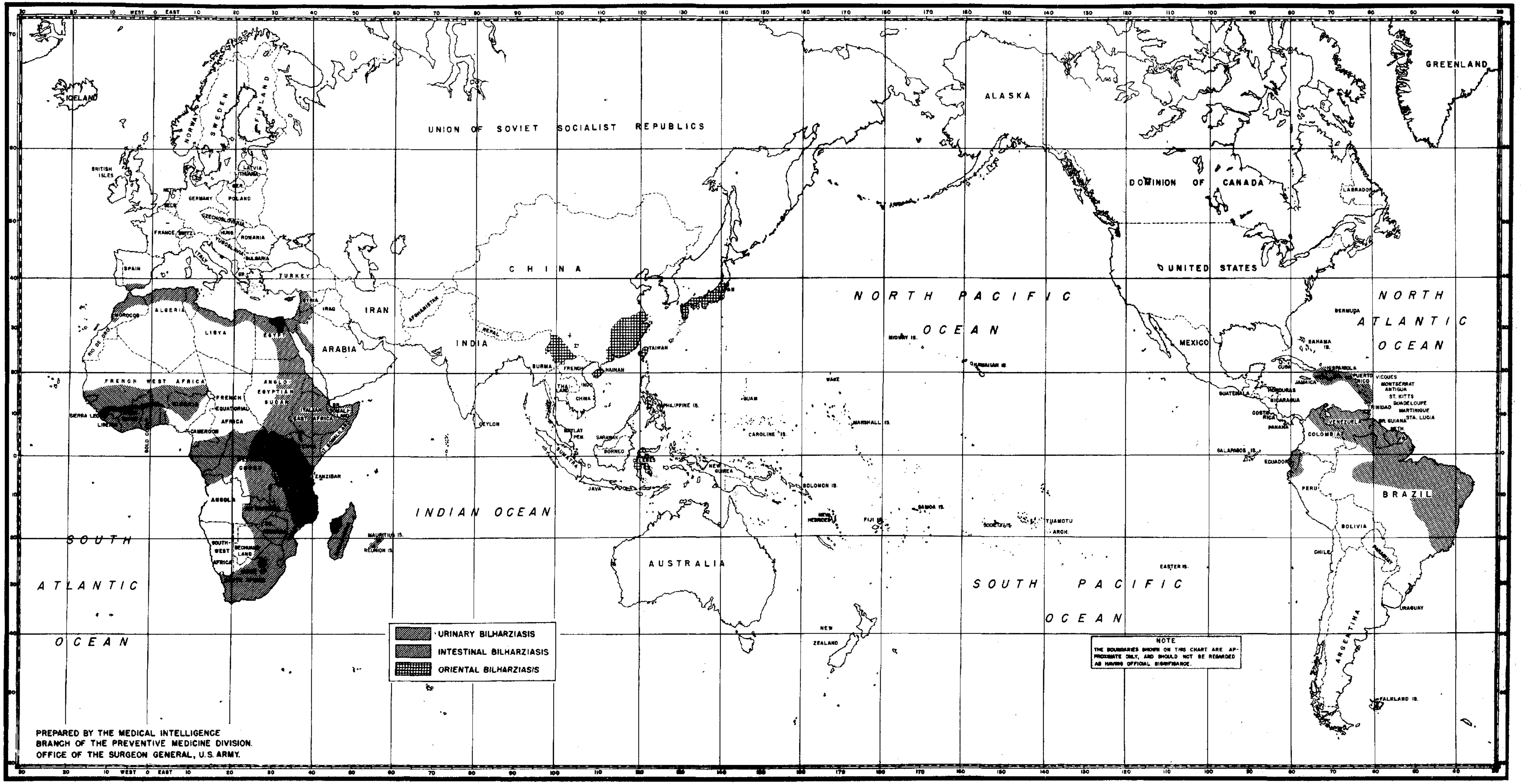
(2) Wind

Up to a velocity of 8 mph, wind conditions can be considered as favorable for area screening. Where the velocity exceeds 12 mph, the smoke will be thinned; when it is over 16 mph, a continuous smoke effect can no longer be achieved even with the highest expenditure of ammunition. The stronger the wind, the more the smoke will be held down to the ground, and the lower will be the height of the screen.

(3) Terrain

Ammunition expenditure is lower in hollows, woods, bushy country, and thick undergrowth. The necessary ammunition expenditure increases in hilly or bare country. Pronounced ridges and hollows can only be screened with dense smoke under especially favorable conditions. For these reasons the breadth of the target sector allotted to a battery with a given ammunition expenditure must be adjusted according to the topography of the sector.

SCHISTOSOMIASIS



PREPARED BY THE MEDICAL INTELLIGENCE
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SECTION I

AIR

1. JAPANESE FIGHTER AIRCRAFT

In the early stages of the war, the designation "Zero" probably was used erroneously as a generic term for almost any type of Japanese fighter aircraft, and this has resulted in a certain amount of confusion. As a matter of fact, the term "O" or "Zero" was derived from the Japanese year 2600 which coincides with our year 1940, and merely indicates that the aircraft was put into service originally in 1940.

The phrase "Zero" may refer to a single place carrier-borne fighter or to a similar version on floats. In addition, it may be used to designate a float reconnaissance-biplane or a two-engine land-based reconnaissance-fighter. As a matter of fact, Zero models of all the aircraft mentioned above have been identified. They are known today by their code names, "Zeke," "Hap," "Rufe," "Pete," and "Dinah." In addition, there is a bomber called "Gwen" and a small submarine based float biplane called "Glen," both of which bear the Zero classification.

At the present time, there are two Zero fighters, "Zeke" and "Hap." "Zeke" is designated by the Japanese as the Type Zero, Mark I, Carrier-borne Fighter, Model 2. The designation of "Hap" is the same, except that "Hap" is Mark II where "Zeke" is Mark I.

"Zeke" is the fighter which has been encountered frequently in current operations in the Southwest and South Pacific Areas. It is capable of a maximum emergency speed of about 326 miles per hour at an altitude of 16,000 feet. An outstanding feature of this aircraft is its high rate of "zoom." It can "zoom" nearly vertically, and the "zoom" can be continued for 1,500 to 2,000 feet depending upon the starting speed. This should not be considered, however, as indicative of the rate of climb of this aircraft. The maximum rate of climb at sea level has been found to be approximately 2,750 feet per minute. The service ceiling is estimated at 38,500 feet. The normal range of this airplane is believed to be about 1,100 miles, but by addition of a belly tank, which can be dropped at will, a maximum range of some 1,700 miles at economical cruising speed is believed possible.

"Zeke's" low wing loading, steep angle of climb, well streamlined structural design and exceptionally sturdy construction make it a highly maneuverable aircraft at moderate speeds. However, in recent tests where "Zeke" was flown in combat maneuvers against several of our aircraft, two points of weakness were detected in the Japanese fighter: (1) at high speeds, the rate of roll is extremely slow, and (2) the engine cuts out if the nose is lowered suddenly to enter a dive. In addition to these points, the vulnerability of "Zeke's" fuel and oil tanks is well known since these aircraft carry neither armor nor self-sealing protection for the tanks. In some instances in the past, it has been reported that wings have been torn off Zero fighters when recovering from extended dives at high speed. The model tested, however, although intentionally designed for light construction, appears capable of reasonably high diving speeds if properly handled.

There are several other types of Japanese fighters at present in operation. Prominent among these is "Hap," a new fighter with nearly square wing tips, reported as superior to "Zeke" in maneuverability and to have an even higher speed and rate of climb. It is reported that Japanese pilots of this plane have not hesitated to follow our fighters in power dives, which may indicate an increase in structural strength.

"Nate" is another Japanese fighter which has seen service in many of the Pacific areas. This is an older model (Type 97) and does not equal the speed or performance of the more recent "Zeke" or "Hap." "Nate" is believed to have a top speed of approximately 250 miles per hour at 13,000 feet altitude. With maximum fuel, at economical cruising speed, it is believed to have a maximum range of slightly over 1,000 miles.

"Oscar" (Type I) is believed to be a more recent modification of "Nate." It has greater maneuverability and a good rate of climb but is believed to be about 20 miles per hour slower than "Zeke" at top speed. Like "Zeke," "Oscar" has an exceptionally long range when carrying maximum fuel and is believed capable, under these circumstances, of obtaining approximately 1,700 miles at economical cruising speed.

In addition to the land based fighters mentioned above, there is also a Zero floatplane fighter called "Rufe." Except for substitution of the floats to replace the wheeled landing gear, this aircraft is believed to be practically the same as "Zeke" structurally. It is reported, however, to be considerably slower than "Zeke" and less maneuverable.

All of the Japanese fighters mentioned above, are powered with radial air-cooled engines. "Nate's" engine has nine cylinders and is estimated to produce about 790 horsepower at an altitude of 11,500 feet. The engines used on the other fighters are twin-row with fourteen cylinders, and are believed to produce 900 to 1,000 horsepower at about 11,500 feet. The armament of "Zeke," "Rufe," and "Hap" consist of two 20-mm Oerlikon type cannons, one in each wing, and two 7.7-mm machine guns firing through channels in the upper part of the engine cowling and sychronized with the propeller. "Oscar's" armament is believed to consist of one 7.7-mm and one 12.7-mm machine gun firing forward through the propeller disc. Wing guns for this model have been reported but not confirmed. "Nate's" armament is believed to be the same as "Oscar's," although it is reported that a second 7.7-mm gun is substituted, on some occasions, for the 12.7 mm.

Other Japanese fighters less frequently encountered include "Perry," "Claude," and "Dick." So far as known, these are little used at the present time. In addition to these fighters of native Japanese design, it is known that the Japanese Air Force has in operation a small number of Messerschmitt 109 E fighters. Whether these are copied from German models or obtained intact from Germany is not known. Up to the present, they have been encountered only in small numbers.

It is well to bear in mind that Japanese fighter aircraft appear to be used with minor alterations by both the Army and Navy Air Services. "Zeke" and "Hap," although used prominently by the Navy, have been reported in operation with Army units also. Likewise, "Nate" and Oscar," which have been reported most frequently in use by the Army, have, upon occasions of emergency, been used by the Naval Air Service.

ANTIAIRCRAFT

2. GERMAN ROPE BARRAGE

According to a German publication, the German Air Defense League has requested its members and people living in certain districts to help the antiaircraft defense by searching for and collecting parachutes and ropes the day after an enemy raid. These are to be used for "sailing shells," a kind of rope barrage, somewhat similar to the British balloon barrage. These shells have rarely been used by the Germans, who have up to the present paid more attention to the production and improvement of antiaircraft artillery and night-fighter aircraft. Now, if enemy aircraft approach Berlin, to take an example, a rope barrage may be put up around the center of the town in addition to the usual air defense barrage.

German Army testing establishments have carried out a great number of tests with these shells, which are fired as ordinary projectiles. When they explode, a rope about 200 yards long attached to a parachute unrolls and sinks slowly to the ground, forming an obstruction, which, according to German antiaircraft officers, is much more dangerous to aircraft than the more rigid British balloon barrage. At one end of the rope there is an explosive adjusted for time ignition. If no aircraft catches in the rope within 10 minutes, the explosive charge is automatically detonated.

It is reported that use of these shells has recently begun, and that they form part of the equipment of every antiaircraft battery.

Comment: The "rope barrage" is in reality, no doubt, a form of aerial minefield. This sort of thing is perfectly feasible, though such a minefield would cover only a fairly limited area. It could be utilized to defend an area which was being heavily attacked. An average height at which aircraft were operating would be determined, and the barrage fired to that approximate height. The projectile itself would almost certainly be rocket-fired. Again, there would be no difficulty in designing a rocket projectile containing a parachute and length of wire with an explosive charge attached.

ANTITANK *

3. RUSSIAN ANTITANK TACTICS

No particular reference to any specific engagement was made in the report which follows, though the subject dealt with is based on information received from the Russian front and published in the Red Army newspaper "Red Star."

Antitank tactics as practiced by the Russians are based on the essential

* Article No. 11, this issue, should be of interest to tank destroyer units.

need to separate the tanks from their supporting infantry. The German tactics of exploitation very often give opportunities of achieving this object. During the earlier phases of the war, before the Russians had realized the best methods of dealing with the enemy armored formations, the deep thrusts of the German "Panzers" actually did cause a certain amount of disintegration, but by the time the outer defenses of Moscow were reached these thrusts failed to achieve their object.

Russian infantry are trained to stop tanks if possible, but when it appears that the infantry are going to be overrun, they get into slit trenches and lie low until the waves of tanks have gone through. Then they come out and put up the strongest possible resistance against the German infantry to prevent it from maintaining contact with the tanks. The artillery is trained to operate on exactly the same lines; if the gun position is overrun, crews go to earth and re-man their guns as soon as the tanks have passed them.

Once the tanks, in rear of the Russian positions, have been cut off from their supporting infantry, every effort is made to prevent their retirement and to mop them up. Mobile antitank groups are formed to harry them, and whenever they go into bivouac, the nearest infantry are instructed to attack them, particularly at night. In fact, whenever tanks are known to be halted in the vicinity, infantry tank-hunting parties are sent to engage them. The air force is always called upon to cooperate extensively in this mopping-up phase.

4. JAPANESE ACTION AGAINST U.S. TANKS

As indicated in the previous article on antitank tactics used by the Russians, tanks must be supported by other arms. A series of incidents involving destruction or loss of American tanks in the Solomons is reported by a member of our armed forced. This report shows the importance, at least in close country, of closely supporting tanks with infantry.

On Guadalcanal a platoon of six light M-3 tanks was sent to aid the infantry forces fighting to the west of the Lunga River. Headquarters tank and tanks Nos. 1, 4, and 5 were moved forward in column to attack enemy machine guns on the edge of the jungle across a clearing from the infantry. Tank No. 4 went into the jungle and has not been found since. Tank No. 5, after entering a short way, backed out of the jungle without having found any targets. The driver of Tank No. 5 said that near the edge of the jungle, the Japanese threw grenades under the tracks. The explosion of the grenades would cause the tank to jump somewhat but did not cause any noticeable damage. This tank was stationary when it was hit on the right forward side of the turret. The shell penetrated the tank and hit the opposite turret wall where it exploded. The driver estimated that the antitank gun which hit his tanks was about 100 yards away. Filling from

the shell ran down and began to burn with a yellow flame and bluish smoke. The driver stated that the fumes were sharp and stifling and caused the mouth to dry and pucker. Almost immediately after the first hit, a second hit was received in the right side of the turret. The shell penetrated and spattered filling around, which likewise began to burn on the floor and on the top of the ammunition lockers. Efforts to put out the fire were unavailing and the survivors jumped out of the tank and started for the rear. Japanese troops were moving toward the tank and shortly after it was abandoned, the driver saw it burning fiercely, but did not know whether the Japanese had thrown gasoline on it or not.

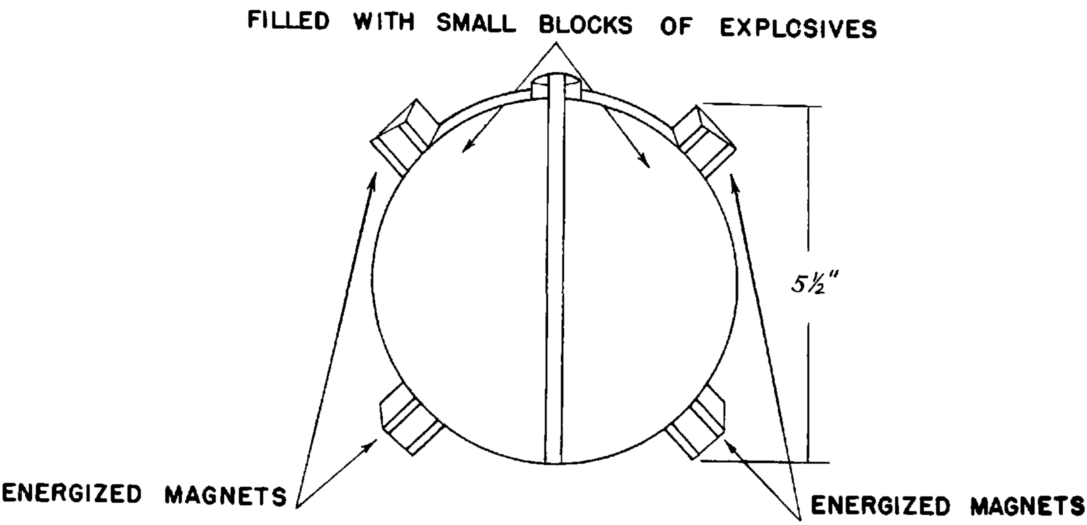
The Headquarters tank was disabled by a hit on the right sprocket wheel while about forty feet into the jungle.

Tank No. 1 was circling in the open field in rear of Tank No. 5 when it was hit in the turret. The lieutenant and radioman were killed but the tank was recovered. Fire in Tank No. 1 was extinguished without great difficulty. The diameter of the hole in Tank No. 1 was slightly larger than that of our 37-mm shell.

The company commander estimated that from the number of hits received by his tanks, and the location of the tanks when hit, the enemy had five antitank guns. The caliber of the enemy guns was believed to be 47-mm.

Comment: This is the first (at time reported) encounter with the Japanese 47-mm antitank gun. It easily penetrated turret armor of light M-3 tanks. The action of the shell after entering the tank seems to indicate an explosive filler made from a picrate derivative. The enemy apparently waited for a close range shot before opening fire.

There was no evidence of the use of the magnetic tank grenade although some had been captured previously on Guadalcanal (see sketch below).



Mutual support between tanks and infantry in close terrain is still a necessity.

5. AMMUNITION FOR GERMAN 42-MM ANTITANK GUN

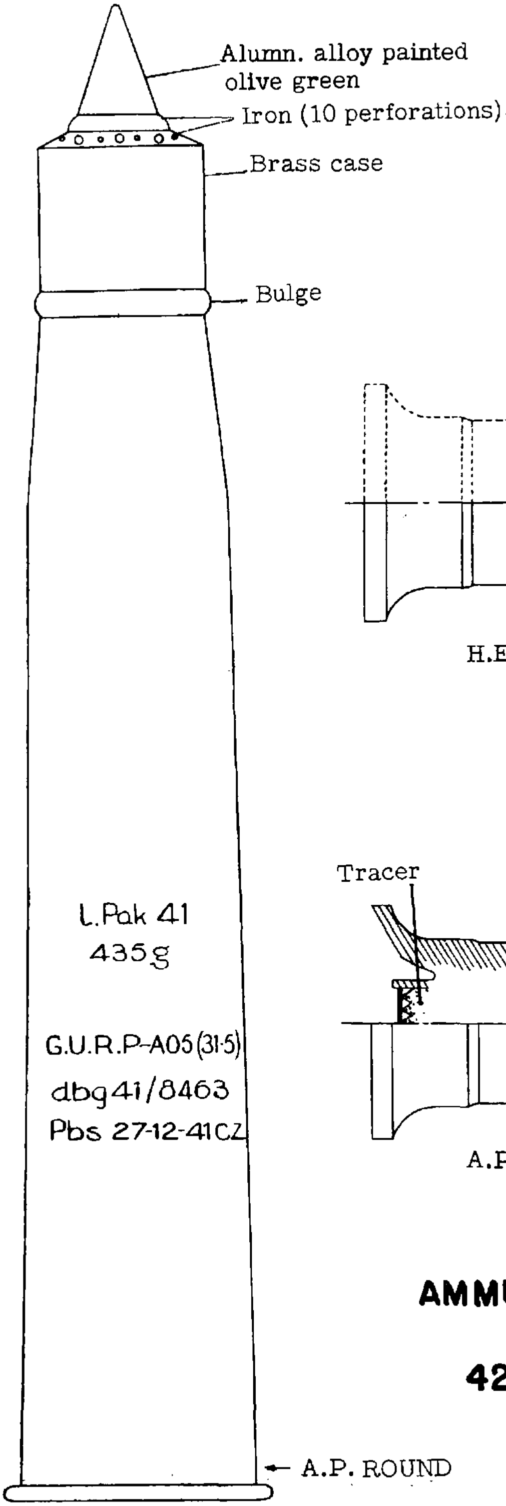
Brief mention has already been made in Tactical and Technical Trends (No. 7, p. 3) of the German 4.2-cm Pak 41 (42-mm antitank gun). This is a tapered-bore weapon, being 42 mm at the breech and 28 mm at the muzzle. High explosive and armor-piercing ammunition is provided. Both the HE and AP ammunition (see accompanying sketch) are characterized by a relatively large propellant charge and a flaring skirt or fin at the base of the projectile. The brass-coated steel shell case is 400 mm (15.75 inches) in length. The skirt of the projectile, which is squeezed down as the projectile travels through the tapered bore, serves to give a large effective base area at the commencement of shot travel. A high muzzle velocity is thus possible with a relatively light weapon. However, owing to the relatively light weight of the projectile,the velocity tends to fall off rapidly, and maximum armor-piercing performance is achieved at short ranges only. The thickness of armor penetration is considerable in relation to the weight of the gun; the hole made, is, of course, small. Barrel wear is high; just what the life of the barrel may be is not known. However, in the case of a similar German weapon, the 2.8-cm Pak 41 (antitank gun tapering from 28 mm at the chamber to 20 mm at the muzzle) the life of the barrel is thought to be not over 400 rounds. The muzzle velocity of the 42-mm is not known; that of the 28-mm is thought to be 4,700 feet per second.

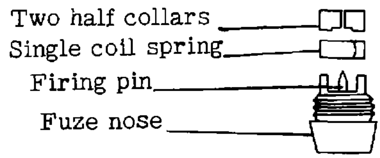
As indicated in the sketch the HE and AP projectiles are similar in shape. They are sometimes referred to as arrowhead ammunition. The perforations or holes (see sketch) are designed to decrease the mass of the skirt or fin as it is squeezed down into the recess in the projectile casing while traveling through the bore. The explosive filling of the HE projectile is blue in color,which suggests Hexagen (trimethylene trinitramine). The nose percussion fuze of the HE shell is aluminum,with the body in two sections. This fuze is of the bore-safe type; before firing,the single coil spring keeps the two half-collars squeezed against the firing pin which is thereby prevented from being depressed; in flight the centrifugal force created by the rotation of the projectile forces the two half-collars apart, and the firing pin is then free to move toward the cap on impact.

The stenciled lettering on the shell case (see sketch) has the following significance:

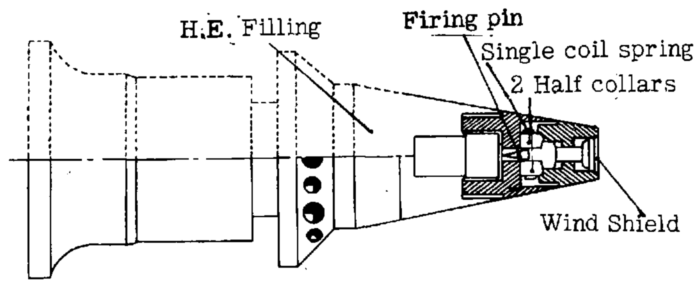
First line. . . . . .light antitank gun 41
Second line. . . . . .weight of propellant in grams
Remaining lines . . . . .data on propelling charge

The HE shell case contains 310 grams of propellant and is so stenciled.

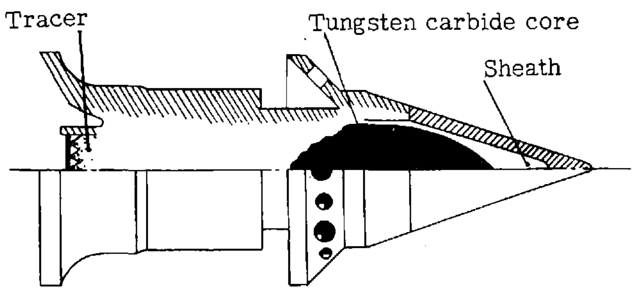




FUZE



H.E. PROJECTILE



A.P. PROJECTILE

AMMUNITION FOR GERMAN

42 mm. ANTITANK GUN

ARMORED FORCE *

6. USE OF FLAME-THROWERS ON TANKS

A German manual on tank tactics refers to the special use of flame-throwers on tanks. Usually they are employed at the halt during an advance by bounds.

Their chief use is to get at any enemy among rocks, in cellars, in dug-outs, in solidly built buildings, in wooded areas, and generally in places not accessible to tanks, and against which gun fire is of little use. The flame-thrower is also used for rapid "cleaning up" of trenches and dug-in positions. The flame-throwing tank must approach to within 50 or 60 yards of the target.

ARTILLERY *

7. GERMAN PRECAUTIONS AGAINST COUNTERBATTERY FIRE

Toward the end of September 1942, it was noted that the Germans in North Africa were increasing their precautions against British counterbattery fire. Among the methods used were these:

(1) Harassing missions by day were fired from roving gun positions in the open.

(2) Adjustments were made by using one or two guns sited on a flank.

(3) The fire of both light and medium batteries was directed into the same area at the same times in order to increase the difficulties of locating battery positions.

(4) Up to six batteries were fired simultaneously in order to confuse British sound-ranging. Dummy flashes are also reported to have been used, but this is not confirmed.

* Article No. 11, this issue, should be of interest to armored and field artillery units.

ENGINEERS

8. ENEMY MINEFIELDS AT EL ALAMEIN

Information concerning the type, layout, and marking of enemy minefields in the El Alamein area has become available from British sources. There is as yet no information as to whether this general method of mine laying was also followed in the Axis retreat from El Alamein.

a. Pattern and Spacing

The minefields were laid in belts, each belt consisting of two to eight rows of mines. Shallow minefields might have only a single belt of mines consisting of from two to four rows; deep fields might have several belts of mines with considerable distance between belts.

The belts themselves might be anything up to 200 yards deep, with an additional danger area consisting of widely scattered mines up to 250 yards in front of the belt. The back of the belt was usually marked with a fence; the distance from this fence to the front fence (if any existed) was anywhere from 100 to 800 yards.

No standard pattern for laying mines in the belts appeared to be used. However, from the mass of data that was available, it was found possible to classify the patterns broadly as follows:

(1) Regular Pattern

This is the most common. Mines in a given row are spaced at equal distances; there is an equal distance between rows; and the mines of one row are equally spaced between the mines of the previous row. A variation in this method is to vary the distances between rows. In no reported case, except for scattered mines, has the distance between mines in a row been unequal.

(2) Regular Pattern Offset

By a system of pacing, a certain variety is introduced into the regular pattern. The distance between mines in any one row is equal, but one row is slightly offset from the previous row, and the next row is again offset by a different distance. Once a few mines have been located, the pattern soon becomes apparent and mines will be found where expected.

(3) Random Mines

In front of most regular minefield belts, and particularly in front of gaps, there may be found mines scattered at random and unmarked. These are either continuous, with very wide and irregular spacing, or in clumps more closely spaced but laid to no pattern inside each clump.

The above patterns usually resulted in a density of a little less than 1 mine per yard of front. Densities up to 2 mines per yard were generally not found except when blocking roads, trails, or defiles.

The spacing between the mines in a given row is from 3 to 10 yards, with the average spacing being 6 yards. As noted in (1) above, in no reported case, except for scattered mines, has the distance between mines in a row been unequal.

The most common spacing between the rows themselves is reported to be usually about 5 yards or 10 yards.

b. Marking of Field

The front edge of forward minefields is often not marked. The rear edge normally is marked, usually with a trip wire on short stakes, though cattle-fence, concertina wire, and stone cairns are sometimes used. Cases have been reported of the rear edge being unmarked.

A common marking is a single row of concertina wire running along the center of a field parallel to the rows of mines. In a large minefield there may be several rows of mines in front unmarked, then a row of concertina wire, more mines, then concertina wire, and so on, finishing up with a row of concertina wire on the rear edge.

The marking of fields by furrows, commonly used at Tobruk, has only once been reported at El Alamein, and in that case the field was a dummy one.

Only one case has been reported of continuous wire running irregularly within a field. It is believed that skull and crossbones indicate the presence of antitank mines or booby traps.

In the rear areas, enemy minefields may be expected to be well marked with cattle-fences and warning notices in German and/or Italian.

c. Marking of Gaps

Little information is available about gaps through minefields, but the following data have been reported.

(1) Width

10 yards in one case, and 7 in another.

(2) Method of Closing

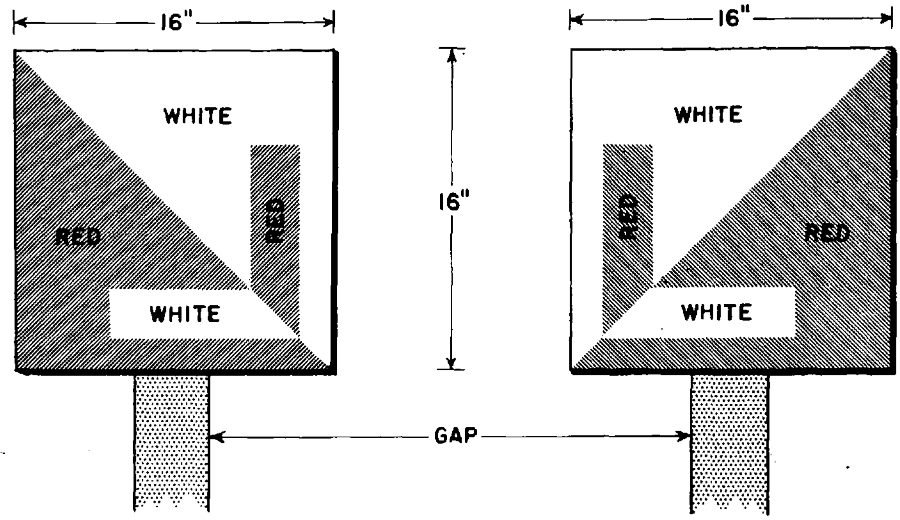
Usually two or three rows of Tellermines (antitank) with boards placed on one or all of the rows to insure detonation of mines if a vehicle

attempts to pass through the gap over the boards, which are normally concealed by a shallow cover of soil.

(3) Marking

In the northern sector, two types of gap markers have been found:

(a) Painted signs, as in sketch, on either side of the gap.



(b) Luminous tubes 1 inch long placed on the tops of mines to mark a route for patrols. These tubes are visible 3 yards away.

(4) General

It is reported that gaps are a favorite place for laying Tellermines without any marking wire or signs. Gaps are sometimes covered by groups of scattered mines laid up to 2,000 yards in front of the gap, and unmarked.

d. Types of Mines

German, Italian, French, and British mines were all used by the enemy at El Alamein. Relatively few booby traps were found in the minefields, and the traps found were almost invariably attached to German Tellermines. Antipersonnel mines (usually Italian B4's) were found at times, generally as a single row laid in front of the outer wire of a minefield. The antipersonnel mines were spaced from 7 to 10 yards apart, with wooden pegs driven between the mines, these pegs being used to attach the trip wiring from the mines on each side of the pegs.

e. Tactical Siting

One report states that the minefield is usually 200 to 300 yards in front of the MLR, and covered by fire and listening posts. In another report the distance from the MLR to the main minefield is given as varying from 200 to 1,000 yards. A listening post was also located by a patrol 100 to 150 yards behind a minefield. It can be definitely stated that it is the enemy's practice by day to cover all main minefields with small-arms fire from close range, and by night to maintain antilifting patrols, as well as listening posts often located within the minefield itself.

Comment: It should be realized that the above information applies to the enemy mine tactics at El Alamein. It is to be expected that his tactics will change from time to time as a result of experience, expediency, change in terrain, or change in command personnel.

9. CONSTRUCTION OF BRITISH ADVANCED LANDING FIELDS

The terrain of the Cyrenaican theater, over which the campaign of November 1941 to January 1942 was fought, is desolate, bare, and devoid of almost all the usual terrain features. Under such conditions, it was only natural that the work of the British engineers was of singular importance.

One of the major roles of the engineers in this campaign was the construction of advanced landing fields for both bomber and pursuit aircraft. For all engineer work, in the field or elsewhere, early warning of the requirements is needed; such warning is particularly necessary in the case of advanced landing-field construction in modern fast-moving battles under desert conditions. Broadly speaking, the advanced landing fields for fighter and other squadrons were constructed by two mobile construction parties of army engineers; these parties were reinforced as required by other engineer units of army or corps. Behind, and advancing to take over as the army moved forward, was a detachment of construction engineers.

The two mobile construction parties were formed before the operation started; each consisted of 1 officer and 50 enlisted men. These parties were attached to army corps as required. Forward liaison between RAF and army was provided by a senior RAF officer in charge of landing-field selection, and by appropriate engineer officers of field rank. The close liaison thus obtained produced very satisfactory results.

In all, during the 2 months following November 18, fourteen entirely new landing fields were constructed. All landing fields consisted of two strips 150 to 300 yards wide; the fighter landing fields were 900 to 1,200 yards long, and the bombers' 200 yards longer; the minimum should however, be not less than 150 by 1,000 and 200 by 1,200 yards, respectively.

Both of the mobile construction parties were motorized; the most suitable trucks were found to be those of the dump type, as most of the work

consisted of moving quantities of earth and stone either on to, or away from, the landing field; each party was allotted a motorized patrol. It was found that the strength of the parties was adequate, but that assistance from other engineer resources had frequently to be sought for landing-field construction and for dealing with work of a more permanent nature on landing fields. Each party should carry a small amount of explosives, materials for wind socks and for marking fields, paint for corner posts, signboards, etc.

For various reasons, the RAF adopted the policy that as many fighters as possible should use an airdrome--in some instances a fighter group of up to five squadrons. This policy necessitated large dispersal areas.

The following two examples give an idea of the minimum time required to prepare an advanced landing field. In each instance one party, organized as above, cleared two strips 1,100 yards by 300 yards; in one case work started at 0700 and fighters were operating from the field the same day, and in the other case at 1000 the next day. In general, however, it may be said that the mobile construction party or a platoon of combat engineers can clear and mark one strip a day, the landing field being completed, with two strips and all markings, in 3 days.

Another task of the greatest importance was the successful preparation of a strip 560 by 30 yards to enable 60 fighters to take off from a landing field water-logged as a result of a week's rain. This task was effected by filling up the soft spots with stone and draining away the standing water. All serviceable aircraft got off.

10. ENEMY BOOBY TRAP

A report from the Middle East states that the enemy is using a booby trap consisting of a hand grenade inside a water bottle. Explosion occurs when the cork is withdrawn. How the grenade is inserted is not known.

11. TACTICAL EMPLOYMENT OF GERMAN 75-MM ASSAULT GUN

The German 75-mm assault gun (7.5-cm Sturmgeschütz) is a weapon comparable to the U.S. 75-mm and 105-mm self-propelled guns. The gun and mount weigh about 20 tons. Its maximum speed cross-country is about 7 mph, on roads about 22 mph; it can average about 15 mph. On normal roads its radius of action is about 100 miles, cross-country about 50 miles. To move an assault-gun battery 100 kilometers (about 65 miles) requires 4,000 liters (about 1,050 gallons) of gasoline. The range of the 75-mm short-barrelled tank gun (7.5-cm KwK), with which this weapon was originally equipped, is about 6,000 yards.

It is reported that there are now apparently three types of assault guns in service. These are: the Stu.G. 7.5-cm K, mounting the 7.5-cm KwK (short-barreled tank gun--23.5 calibers*); the Stu.G. lg. 7.5-cm K, mounting the 7.5-cm KwK 40 (long-barreled tank gun--43 calibers); and a third weapon, nomenclature at present unknown, which appears to have a 75-mm gun with a bore 30 calibers in length. It seems probable, therefore, that the 7.5-cm KwK 40, which is the principal armament of the new Pz. Kw. 4 (Mark IV tank), may be primarily an antitank weapon, while the latest intermediate gun will take the place of the old Stu.G. 7.5-cm K as a close-support weapon.

While some technical details of this weapon have been known for some time, relatively little information has been available until recently concerning its tactical employment. Two German documents on the tactical use of this weapon have now been received. One is dated May 1940, the other April 1942. The second document is essentially identical in substance with the first, except that the second contains some additional information. Both documents have been combined into one for the present report, and such apparent contradictions as exist are noted in the translation which follows.

* * *

Instructions for the Employment of Assault Artillery

a. Basic Principles and Role

The assault gun (7.5-cm gun on an armored self-propelled mount) is an offensive weapon. It can fire only in the general direction in which the vehicle is pointing.** Owing to its cross-country performance and its armor, it is able to follow anywhere its own infantry or armored troops.

*Length of bore

**Traverse is limited to 20 degrees

Support for the infantry in attack is the chief mission of the assault gun by virtue of its armor, maneuverability, and cross-country performance and of the rapidity with which it can open fire. The moral support which the infantry receives through its presence is important.

It does not fire on the move. In close fighting it is vulnerable because its sides are light and it is open-topped. Besides, it has no facilities for defending itself at close quarters. As it is not in a position to carry out independent reconnaissance and fighting tasks, this weapon must always be supported by infantry.

In support of an infantry attack, the assault gun engages the enemy heavy infantry weapons which cannot be quickly or effectively destroyed by other weapons. In support of a tank attack, it takes over part of the role of the Pz. Kw. 4, and deals with enemy antitank guns appearing on the front. It will only infrequently be employed as divisional artillery, if the tactical and ammunition situation permits. Assault artillery is not to be included in the divisional artillery fire plan, but is to be treated only as supplementary, and to be used for special tasks (e.g., roving batteries). Its employment for its principal tasks must always be assured.

[The April 1942 document states that "The assault gun may be successfully used against armored vehicles, and light and medium tanks." The May 1940 document, however, states "It is not to be used for antitank purposes, and will only engage enemy tanks in self-defense or where the antitank guns cannot successfully deal with them." This apparent contradiction can perhaps be explained by the fact that, prior to the invasion of Russia in 1941, this weapon had been used in limited numbers only. Experience on the Eastern Front may have shown that it could be successfully used against tanks, although Russian sources refer to it as essentially an infantry support weapon. A more logical explanation perhaps lies in two German technical developments since 1940: namely, hollow-charge ammunition, which is designed to achieve good armor-piercing performance at relatively low muzzle velocities, and the reported replacement of the short-barreled low-velocity 75-mm with the long-barreled high-velocity tank gun (7.5-cm KwK 40) on some of the newer models.]

b. Organization of the Assault Artillery Battalion and Its Batteries

The assault gun battalion consists of battalion headquarters and three batteries. The battery has six guns--three platoons, each of two guns.* The command vehicles for battery and platoon commanders are armored. They make possible, therefore, movement right up to the foremost infantry line to direct the fire.

*The April 1942 document states that a battery has 7 guns, the extra gun being "for the battery commander."

c. Principles for Employment

(1) General

Assault gun battalions belong to GHQ artillery. For the conduct of certain engagements, battalions or separate batteries are attached to divisions, or to special task forces. The division commander should attach some or all of the assault artillery batteries under his control to infantry or tank units; only in exceptional circumstances will they be put under the artillery commander. Transfer of batteries from support of one unit to another within the division can be carried out very quickly in the course of a battle. Close liaison with the batteries and within the batteries is of primary importance for the timely fulfillment of their missions. The assault artillery fires from positions in open ground, hidden as far as possible from ground and air observation. Only when employed as part of the divisional artillery will these guns fire from covered positions.

Splitting up of assault-gun units into small parts (platoons or single guns) jeopardizes the fire power and facilitates enemy defense. This should occur only in exceptional cases when the entire battalion cannot be employed, i.e., support of special assault troops or employment over terrain which does not permit observation. If employed singly, mutual fire support and mutual assistance in case of breakdowns and over rough country are not possible.

As complete a picture as possible must be obtained of the enemy's armor-piercing weapons and the positions of his mines; hasty employment without sufficient reconnaissance might well jeopardize the attack. Premature deployment must also be avoided. After an engagement, assault guns must not be given security missions, especially at night. They must be withdrawn for refuelling, overhauling, and resupply. After 4 to 5 days in action, they must be thoroughly serviced. If this is not possible, it must be expected that some will not be fit for action and may fall out. When in rear areas, they must be allotted space near repair shops so that they are readily accessible to maintenance facilities, etc.

Troops co-operating with assault guns must give all support possible in dealing with mines and other obstacles. Artillery and heavy infantry weapons must give support by engaging enemy armor-piercing weapons.

Surprise is essential for the successful employment of assault-gun battalions. It is therefore most important for them to move up and into firing positions under cover, and generally to commence fire without warning. Stationary batteries fire on targets which are for the moment most dangerous to the infantry (especially enemy heavy infantry weapons), destroy them, and then withdraw to cover in order to avoid enemy fire. With the allotment of smoke ammunition (23 percent of the total ammunition issue),* it is possible to lay smoke and

*According to the April 1942 document, the issue is only 10 percent smoke. It is probable that the ammunition issue depends on the particular operations involved.

to blind enemy weapons which, for example, are sited on the flank. Assault artillery renders support to tanks usually after the hostile position has been broken into. In this role, assault-gun batteries supplement Pz. Kw. 4s, and during the fluid stages of the battle direct their fire against enemy antitank weapons to the direct front. They follow very closely the first waves of tanks. Destruction of enemy antitank weapons on the flanks of an attack will frequently be the task of the Pz. Kw. 4.

Against concrete positions, assault guns should be used to engage casemates with armor-piercing shells. Co-operation with assault engineers using flame-throwers is very effective in these cases.

Assault guns are only to be used in towns and woods in conjunction with particularly strong and close infantry support, unless the visibility and field of fire are so limited as to make use of the guns impossible without endangering friendly troops. Assault guns are not suitable for use in darkness. Their use in snow is also restricted, as they must usually keep to available roads where enemy defense is sure to be met.

(2) Tactical Employment

(a) On the Move

Vehicles on the move should be kept well spaced. Since the average speed of assault guns is about 15 mph, they must be used in leap-frog fashion when operating with an infantry division. Crossing bridges must be the subject of careful handling. Speed must be reduced to less than 5 mph, and the assault guns must keep exactly to the middle of the bridge, with intervals of at least 35 yards. Bridges must be capable of a load of 22 tons. The commander of the assault guns must cooperate with the officer in charge of the bridge.

(1) In the Infantry Division

While on the move, the division commander keeps the assault-gun battalion as long as possible under his own control. According to the situation and the terrain he can, while on the move, place one assault gun battery in each combat team. The attachment of these weapons to the advance guard is exceptional. In general, assault gun batteries are concentrated in the interval between the advance guard and the main body, and are subject to the orders of the column commander.* On the march, the battery commander and his party should accompany the column commander.

*The April 1942 document states that "an assault gun battery well forward in the advance guard may ensure the rapid crushing of enemy resistance." It does not specify whether this is applicable to operations with infantry or with armored elements.

(2) In the Armored Division

On the move, the assault gun battalion attached to an armored division can be used to best advantage if included in the advance guard.

(b) In the Attack with an Infantry Division

The division commander normally attaches assault-gun batteries to the infantry regiments. On receipt of orders placing him under command of an infantry regiment, the battery commander must report in person to the commander of that infantry regiment. Exhaustive discussion between these two (as to enemy situation, preparation of the regiment for the attack, proposed conduct of the attack, main point of the attack, co-operation with divisional artillery, etc.) will provide the basis for the ultimate employment of the assault-gun battery.

It is an error to allot to the battery tasks and targets which can be undertaken by the heavy infantry weapons or the divisional artillery. The battery should rather be employed to engage such nests of resistance as are not known before the beginning of the attack, and which, at the beginning or in the course of the battle, cannot be quickly enough engaged by heavy infantry weapons and artillery. It is the special role of the assault-gun battery to assist the infantry in fighting its way through deep enemy defense zones. Therefore, it must not be committed until the divisional artillery and the heavy infantry weapons can no longer render adequate support.

The attached battery can be employed as follows:

(1) Before the attack begins, it is located so as to be capable of promptly supporting the regiment's main effort; (or)

(2) The battery is held in the rear, and is only committed if, after the attack begins, a clear picture is obtained of the enemy's dispositions.

Under both circumstances the attachment of the battery, and occasionally of individual platoons, to a battalion may be advantageous.

The commander under whose command the battery is placed gives the battery commander his orders. The latter makes clear to his platoon commanders the specific battle tasks, and shows them, as far as possible on the ground, the targets to be engaged. When in action the battery commander, together with his platoon commanders, must at all times be familiar with the hostile situation, and must reconnoiter the ground over which he is to move and attack. The battery will be so disposed by the platoon commanders in the sectors in which it is expected later to operate that, as it approaches the enemy, the battery, under cover, can follow the infantry from sector to sector. How distant an objective can be given, and yet permit the control of fire by the battery and platoon commanders, is dependent on the country, enemy strength, and enemy

action. In close country, and when the enemy weapons are well camouflaged, targets cannot be given to the platoons by the battery commander. In these circumstances, fire control falls to the platoon commanders. The platoons must then co-operate constantly with the most advanced infantry platoons; they remain close to the infantry and engage the nearest targets. The question of dividing a platoon arises only if individual guns are allotted to infantry companies or platoons to carry out specific tasks: e.g., for action deep into the enemy's battle position.

In an attack by tanks attached to an infantry division, the assault-artillery battalion engages chiefly enemy antitank weapons. In this case too, the assault-gun battalion is attached to infantry elements. Well before the beginning of the tank attack, the batteries are disposed in positions of observation from which they can readily engage enemy antitank weapons. They follow up the tanks by platoons, and under special conditions--e.g., in unreconnoitered country-- by guns, as soon as possible. In a deep attack, co-operation with tanks leading an infantry attack is possible when the hostile islands of resistance have been disposed of.

In the enemy tank counterattack, our own antitank guns first engage the hostile tanks. The assault-gun battalion engages the enemy heavy weapons which are supporting the enemy tank counterattack. Only when the antitank guns prove insufficient, do assault guns engage enemy tanks. In this case the assault guns advance within effective range of the enemy tanks, halt, and destroy them with antitank shells.

(c) <u>In the Attack with an Armored Division</u>

In such an attack, the following tasks can be carried out by the assault-gun battalion:

<u>(1)</u> Support of the tank attack by neutralizing enemy antitank weapons; (and/or)

<u>(2)</u> Support of the attack by motorized infantry elements.

According to the situation and the plan of attack, the battalion, complete or in part, is attached to the armored brigade, sometimes with parts attached also to the motorized infantry brigade. Within the armored brigade, further allotment to tank regiments is normally necessary. As a rule, complete batteries are attached.

To support the initial phase of the tank attack, assault-gun batteries can be placed in positions of observation if suitable ground is already in our possession. Otherwise the batteries follow in the attack close behind the first waves of tanks, and as soon as the enemy is engaged, support the tanks by attacking enemy antitank weapons.

As the tank attack progresses, it is most important to put enemy defensive weapons out of action as soon as possible. Close support of the leading tanks is the main essential to the carrying out of these tasks.

The support of the motorized infantry attack is carried out according to the principles for the support of the foot infantry attack.

(d) In the Attack as Divisional Artillery

In the attack of a division, the employment of the assault gun battalion as part of the divisional artillery is exceptional. In this role, the assault-gun batteries must be kept free for their more usual mission at all times, and must enter battle with a full issue of ammunition.

(e) In the Pursuit

In the pursuit, assault-gun batteries should be close to their own infantry in order to break at once any enemy resistance. Very close support of the leading infantry units increases their forward momentum. Temporary allotment of individual platoons--under exceptional circumstances, of individual guns--is possible.

(f) In the Defense

In the defense, the primary task of assault artillery is the support of counterthrusts and counterattacks. The assembly area must be sufficiently far from the friendly battle position to enable the assault-gun units to move speedily to that sector which is threatened with a breakthrough. Allotment and employment are carried out according to the plan of the infantry attack. The point of commitment should be arranged as early as possible with the commanders of the infantry units allocated to the counterthrust or counterattack. In the defense as in the attack, the assault-artillery battalion will only be employed in an antitank role if it must defend itself against a tank attack. (Only 12 percent of the ammunition issue is armor-piercing.)* If employed as part of the divisional artillery (which is rare), the battalion will be placed under the division artillery commander.

(g) In the Withdrawal

For the support of infantry in withdrawal, batteries, and even individual platoons or guns, are alloted to infantry units. By virtue of their armor, assault guns are able to engage enemy targets even when the infantry has already withdrawn. To assist disengagement from the enemy, tank attacks carried out with limited objectives can be supported by assault guns. Allotment of assault-gun batteries or platoons to rear parties or rear guards is effective.

*15 percent according to the April 1942 document.

d. Supplies

As GHQ troops, the battalion takes with it its complete initial issue of ammunition, fuel, and rations. When it is attached to a division, its further supply is handled by the division. The battalion commander is responsible for the correct supply of the battalion and the individual batteries, especially in the pursuit. Every battery, platoon, and gun commander must constantly have in mind the supply situation of his unit. It is his duty to report his needs in sufficient time and with foresight, and to take the necessary action to replenish depleted supplies of ammunition, fuel, and rations.

12. CONCEALMENT OF GERMAN TRENCHES

In one of the campaigns in the Middle East (Cyrenaica), reliable reports show that the German tactics put great emphasis on the development of a defensive system best designed to assure ground concealment.

It was found that German trenches were narrow, with no parados, and the spoil for the parapet was well spread out and never more than 9 inches high. The effect was to make the trenches inconspicuous, and it is stated that on one occasion an officer walked to within 30 yards of an enemy post without seeing it.

There were no sandbags and few wire obstacles, and there was a general lack of construction materials. This absence of materials, though it may have been enforced by circumstances, proved entirely effective and made defenses very difficult to locate. Revetting was usually dry-stone walling, but very few posts had overhead cover, protection from the air being obtained rather by the narrowness of the trenches than by concealment. In one area a number of tank turrets were used as pillboxes in fixed defenses and were very effective, providing good protection and being easy to conceal.

13. JAPANESE TASK FORCE IN CHINA

In regard to the various Japanese military campaigns in China during the past year, one factor of outstanding interest has been the composition of their task forces. These task forces appear to have been comprised of units selected from various first-line Japanese divisions. The selection of given units has been based on the convenience of their location with respect to the transportation problem in assembling a task force, as well as on the past record of a unit for efficient service in such forces. It is reported that these task forces have always been dissolved after a particular campaign, and the various units returned to their former stations.

The composition of one of these task forces is given at the end of this article. It should not necessarily be regarded as typical, owing to the circum-

stances noted above, and also because the Japanese, like the Germans, have little regard for the employment of units on the basis of tables of organization. The units are drawn from at least three divisions, though the total strength of the task force is probably less than 7,500 men. Intelligence officers should note that even though a number of small Japanese units are identified on a given front, they willl not necessarily indicate the strength or composition of the Japanese opposition.

For purposes of security, fictitious numbers are used to designate units.

UNIT A Commander: CO 2d Inf, 1st Div
1st Bn, 1st Inf, 1st Div
2d Bn, 2d Inf, 1st Div
3d Btry, 3d Mtn Arty Regt, 1st Div
Medical detachment

UNIT B Commander: CO 2d Bn, 14th Inf
2d Bn, 14th Inf, 15th Div
5th Btry, 16th Mtn Arty Regt, 15th Div
Infantry gun detachment

UNIT C Commander: CO 3d Bn, 22d Inf
3d Bn, 22d Inf, 25th Div
2d Btry, 23d Arty Regt, 25th Div
Infantry gun detachment
Transport detachment
Medical detachment

TASK FORCE TROOPS
Cavalry platoon
Artillery battery
4th Btry, 1st Bn, 3d Mtn Arty Regt, 1st Div
Engineer company
Transport detachment
Signal detachment (radio)
Medical detachment
10th F Hosp (from 48th Div)
Veterinary detachment (from Fifth Army)
Water purification detachment

MEDICAL

14. SNAKE BITE*

a. General

Poisonous snakes are found throughout the temperate and tropical areas of the world, though the species to be encountered vary greatly on the different continents. Examples are the rattlesnake of North America, the fer-de-lance of Central and South America, the viper or adder of Europe, the mamba of Africa, the cobra of southern Asia, and the tiger snake of Australia. The danger of suffering a snake bite is greatly overemphasized, since these reptiles usually will not attack man unless disturbed. Such danger is probably greater in certain parts of the United States than in any other part of the world, with the possible exception of India and Burma. Unless one has some knowledge of the habits and habitat of snakes and is searching for them, they are infrequently encountered in ordinary travels.

In case of snake bite, it is important to kill the snake and have it examined, if possible. There are several different types of snake antivenom, and if the snake is identified it is much easier to select the proper type of antivenom for the treatment of the bite. The presence of an undigested or partially digested "ball" of food in the snake's stomach may indicate the amount of venom injected into the victim when the snake struck. When a venemous snake kills, a part of the venom is used up; thus, the presence of a visible food ball in the stomach may mean that the snake's poison sacs were relatively empty at the time of biting the victim, and therefore that probably only a small amount of venom was injected.

b. Precautions

(1) Wear boots when walking in snake-infested areas.

(2) When possible, remain on trails.

(3) Avoid the careless touching of shrubs, brush, trees, tree branches, etc., or walking near ledges where snakes may be hiding.

(4) In some areas, snakes may prefer dark, warm places for rest, and may crawl into shoes, clothing, or luggage. This is especially characteristic of the cobra in the Far East. Such articles should be examined carefully before use.

(5) If bitten by a snake the following procedures are recommended:

(a) Immediately apply pressure or tourniquet (rubber tubing, belt, string, piece of shirt, vine, or weed) above the bite--no tighter than a snug garter--to stop return of the venous blood toward the heart. The tourniquet should be released for a few seconds every 10 to 15 minutes to prevent gangrene.

*Prepared in the Office of the Surgeon General.

(b) Under field conditions and in the absence of medical care, do not make an incision, but instead place a piece of rubber dam three or four inches square over the site of the fang punctures, and by vigorously sucking and kneading with the teeth, remove as much venom as possible during a period of 5 minutes. The rubber dam will prevent sucking the venom into the mouth. Wash the wound and the rubber dam, and repeat the sucking and kneading at regular intervals, while removing the patient to the nearest medical officer or other physician.

(c) Kill the snake and take it to the physician for inspection.

(d) Whiskey or other alcoholic drinks should not be given.

(e) As far as possible, keep the patient from exerting himself, for exertion will increase blood flow and thus cause more venom to be absorbed.

MILITARY INTELLIGENCE

15. IDENTIFICATION OF GERMAN PRISONERS

Attention is called to the several ways by which German PWs may be identified by the examination of records found on their person.

a. Identity Disks

These are of three types, viz.--

(1) Those showing the man's present unit (comparatively rare);

(2) Those showing the man's Ersatz (replacement training) unit (most common;

(3) Those bearing the number, but not the APO number. This is a new kind of disk of which, the report states, nothing more is yet known.

The soldier is issued his identity disk by the unit to which he is first assigned. This accounts for the preponderant number of disks showing an Ersatz unit, for the majority of men called up since the first stage of the war would be untrained, and would therefore be assigned to a depot unit for training.

On the other hand, the trained reservists mobilized on the outbreak of war, or previously, would normally be assigned direct to a field unit, whose designation would therefore appear on the identity disk issued to them.

b. Mobilization Regulations Concerning Identity Disks

"Every member of the Army will be issued an identity disk by the unit to which he belongs, or to which he is assigned on the first day of mobilization, or to which he may be sent during the course of the war."

Members of the Frontier Guard (Grenzwacht), home security units * (Sicherheitsbesatzung), and the militarized personnel of the semi-military construction corps (Todt Organization) were issued an identity disk before the war. It bore the Roman number of the Corps Area (Wehrkreis) and a serial number.

c. Replacement of Lost Disks

It is worth noting that a soldier who has lost his original disk is issued a new one, which is stamped with the designation of the new issuing unit and sub-unit.

d. Pay-book (Soldbuch) and Identity Certificate (Truppenausweis)

The German pay-book contains so much information, especially about the soldier's present unit and previous units, that pay-books may be withdrawn from soldiers engaged in specific operations. Flying personnel are not allowed to carry their pay-book on war flights. During the operations at Bardia, Sollum, and Halfaya, the example of the German Air Force was followed generally, and pay-books were withdrawn from the army personnel engaged and kept with the company records together with the Wehrpass (a book containing the permanent military history of the individual). Instead of the pay-book a temporary certificate of identity was carried, giving the following particulars:

Vorlaufiger Personal-Ausweis

(Provisional Personal Identification Certificate)

(A) Inhaber ist der (Bearer is)

Dienstgrad, Name, Zuname.

(rank, first name, surname)

(B) Geb. am (Date of birth)

(C) Wohnhaft in (Home address)

(D) Am-----auf afrikanischem Boden eingetroffen (Arrived on African soil on - [date])

(Official stamp) ....

(Unterschrift)
(signature)

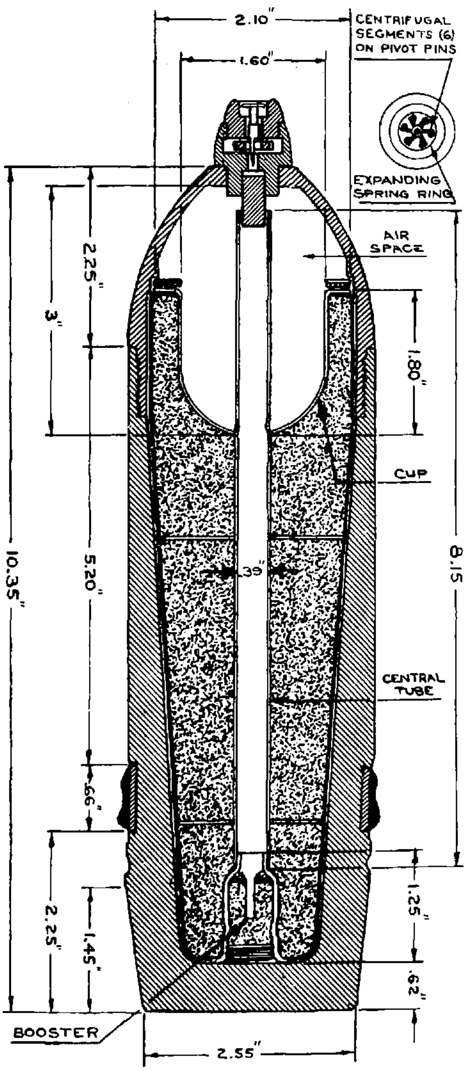
*Sucn as police, Gestapo, etc.

The certificate was signed by the company commander and was stamped with the APO number. Identification was therefore possible in most cases. The certificate was typed on any piece of paper. When folded it was much the same size as the pay-book.

ORDNANCE

16. GERMAN HOLLOW-CHARGE AMMUNITION FOR 75-MM TANK GUN

A sketch showing the details of the hollow-charge round for the German 7.5-cm KwK (75-mm tank gun) accompanies this report. The German nomenclature for this ammunition is 7.5-cm Pz. Gr. Patr. 38 KwK.



The round is of the fixed type. The cartridge case and the weight and type of propellant are similar to those for the other types of 75-mm antitank gun ammunition. The shell is fitted with a threaded hemispherical cap into which is screwed a small nose percussion fuze. From the nose fuze, a central tube runs down to a booster which is situated in the base of the shell. This booster consists of a detonator set in penthrite wax, the whole being contained in a perforated container. The bursting charge consists of three blocks of Hexagen (Trimethylene Trinitramine) the front one of which is concave, as shown in the sketch. The blocks are contained in waxed paper and are cemented into the shell.

The operation of the Aufschlag Zunder or percussiòn fuze (A.Z.38-type fuze) is simple. The striker is held off the detonator assembly by six centrifugal segments which are surrounded by an expanding spring ring. After the shell has left the gun, centrifugal force causes the clock spring and the safety blocks to open, thus freeing the striker. Upon impact, the striker is driven onto the detonator. The detonation passes down the central tube to initiate the booster. This in turn initiates the bursting charge.

The shell is painted white and has black markings. The weight of the shell is 4.5 kilograms, and that of the bursting charge 450 grams.

Comments: This is another instance of the use of hollow-charge ammunition to increase the armor-shattering effect of a gun of comparatively low muzzle velocity. No data is available at this time concerning the performance of this type of projectile against armor at various ranges.

17. GERMAN 37-MM STICK BOMB

This so-called stick bomb was recently developed for the German 37-mm antitank gun. It has a rod which fits into the bore of the gun, and a concentric perforated sleeve which fits over the barrel. The standard 37-mm shell case and primer are used. The propellant charge consists of 216 grams of nitroglycerine tubular propellant. The projectile, has a rounded nose cap and a nose fuze internally identical with that of the German HE rifle grenade. It is presumably a hollow-charge projectile, probably intended to give this gun better armor-piercing performance. The projectile perhaps takes the form of a bomb or grenade, because a hollow-charge shell of a caliber as low as 37-mm would not be effective. The bomb is likely to be effective at short ranges only.

The dimensions of the bomb are:

Over-all length	695 mm	(27.36 in)
Length of bomb	275 mm	(10.83 in)
Length of rod	420 mm	(16.54 in)
Length of sleeve	115 mm	(4.53 in)
Diameter of bomb	145 mm	(5.71 in)
Diameter of rod	36 mm	(1.42 in)
Diameter of sleeve	50 mm	(1.97 in)

18. SLEDS FOR WINTER WARFARE

German sources reveal the use of sleds (Ackja) by the Finns to meet the problems of winter transport.

A small flat-bottomed boat-shaped sled, the keel of which forms the running surface, is used for the transport of light loads of different kinds: ammunition, rations, radio equipment, wounded, and light weapons. The following types of sled, modelled on the Finnish pattern, have recently been introduced into the German Army:

Fig. 2

FINNISH TRANSPORT SLED

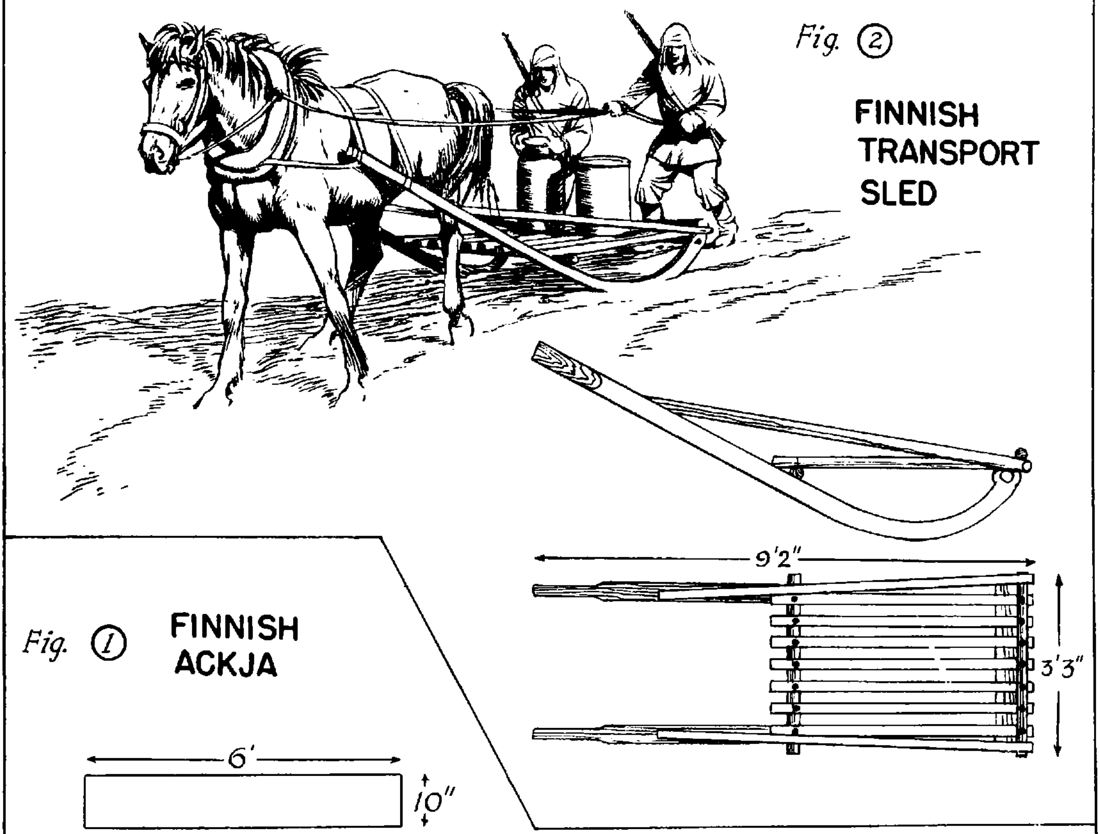
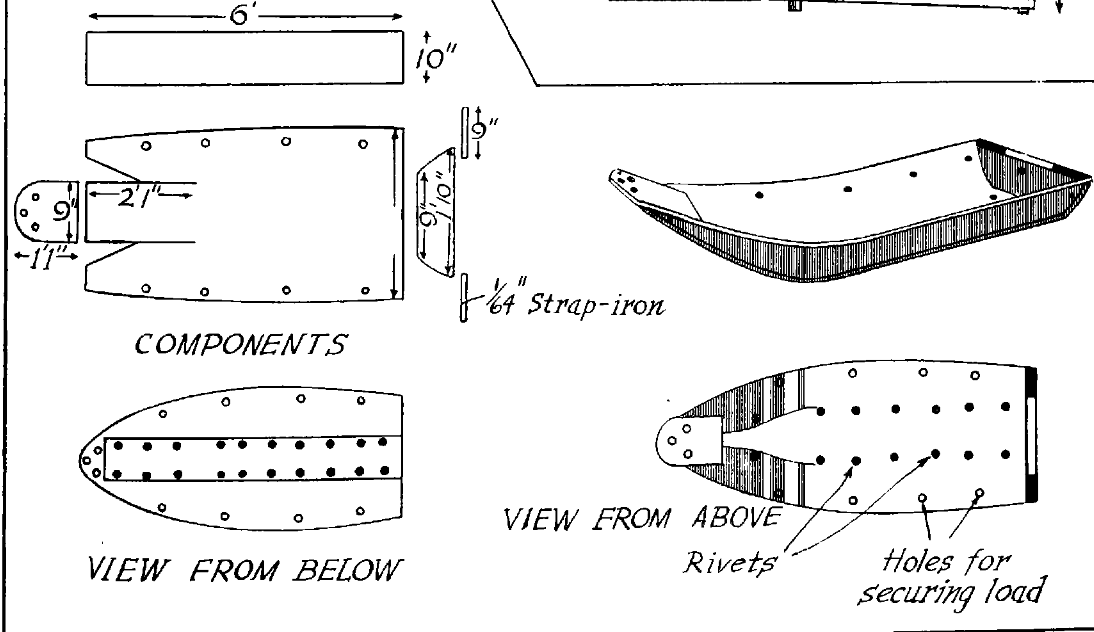


Fig. 1

FINNISH ACKJA



German Designation	English Equivalent
Schlitten 300 kg	Sled, 660 lbs
Schlitten 500 kg	Sled, 1,100 lbs
Krankenschlitten	Ambulance sled
Schlitten 1,000 kg	Sled, 2,200 lbs
Leichter Ackja	Light Ackja
Boots-Ackja	Boat-type (clinker-built) Ackja
Waffen-Ackja	Weapon-carrying Ackja

a. Description

Ackjas may be constructed either of three-ply wood or of ordinary planks, clinker-built (with planks or plates put on so that one edge of each overlaps the edge of the plate or plank next to it, like clapboards on a house).

(1) Plywood Type

An example is shown in the accompanying sketch, figure 1. The various sections of plywood are cut out, partly shaped by soaking in water, and nailed or riveted into position. The stern of the sled is braced by a 3/4-inch-thick wooden batten secured at each end by strips of 1/64-inch strap iron. Dimensions and design are varied to suit the purpose for which the sled is built, but in every case the sled should be as light as possible.

(2) Clinker-Built Type

These are stronger but also considerably heavier than the plywood type. They are constructed exactly like a small boat, and move on a single broad runner along the keel.

b. Propulsion

Ackjas can be pulled in two ways:

(1) By Dogs

The normal team is of two dogs, the first being led. Dogs must be specially trained for this work.

(2) By Men on Skis

In deep snow, a team of men commonly go ahead to clear a track of sufficient width to accommodate the sleds.

c. Light Snow Drag

A simple horse-drawn drag, suitable for transport of light loads, is shown in figure 2 of the sketch.

19. GERMAN MOTORCYCLE TRACTOR

The invasion of Crete revealed for the first time the use by the Germans of the motorcycle tractor for the purpose of hauling light, single-axle, open trailers or light guns. This tractor is known to be employed in the Middle East and, according to recent newspaper accounts, it is now to be seen on the Eastern Front. It is a suitable vehicle for accompanying airborne troops. Early in 1941, it was accepted as an army vehicle and received the number Sd.Kfz.2 (Sonder Kraftfahrzug--special motor vehicle).

a. Body

The accompanying sketches show that the body (1) is a box-like structure made of pressed metal in two halves, and joined along a horizontal plane below the track-guards (2). It contains the driving position (3), the engine (4) and transmission, and a transverse seat (5) at the rear over the cooling system (6). The driver is seated on a saddle (7) mounted above the gearbox (8) and clutch housing (9), and has two rubber knee-pads fitted beneath the dashboard. On each side, the track-guards carry gasoline tanks (10) at the front while, level with the engine, the sides are built up (11) and contain on the left the tool kit and on the right the battery and fuze panel.

At each side of the passenger seat there is a light rail (12), while foot rests, rifle rests (14), and clips (15) are provided at the rear.

b. Engine

The power unit (4) is an Opel "Olympia model 38," gasoline engine, mounted towards the rear of the body. It is a four-cycle, four-cylinder unit developing about 36 brake horse power at 3,400 rpm.

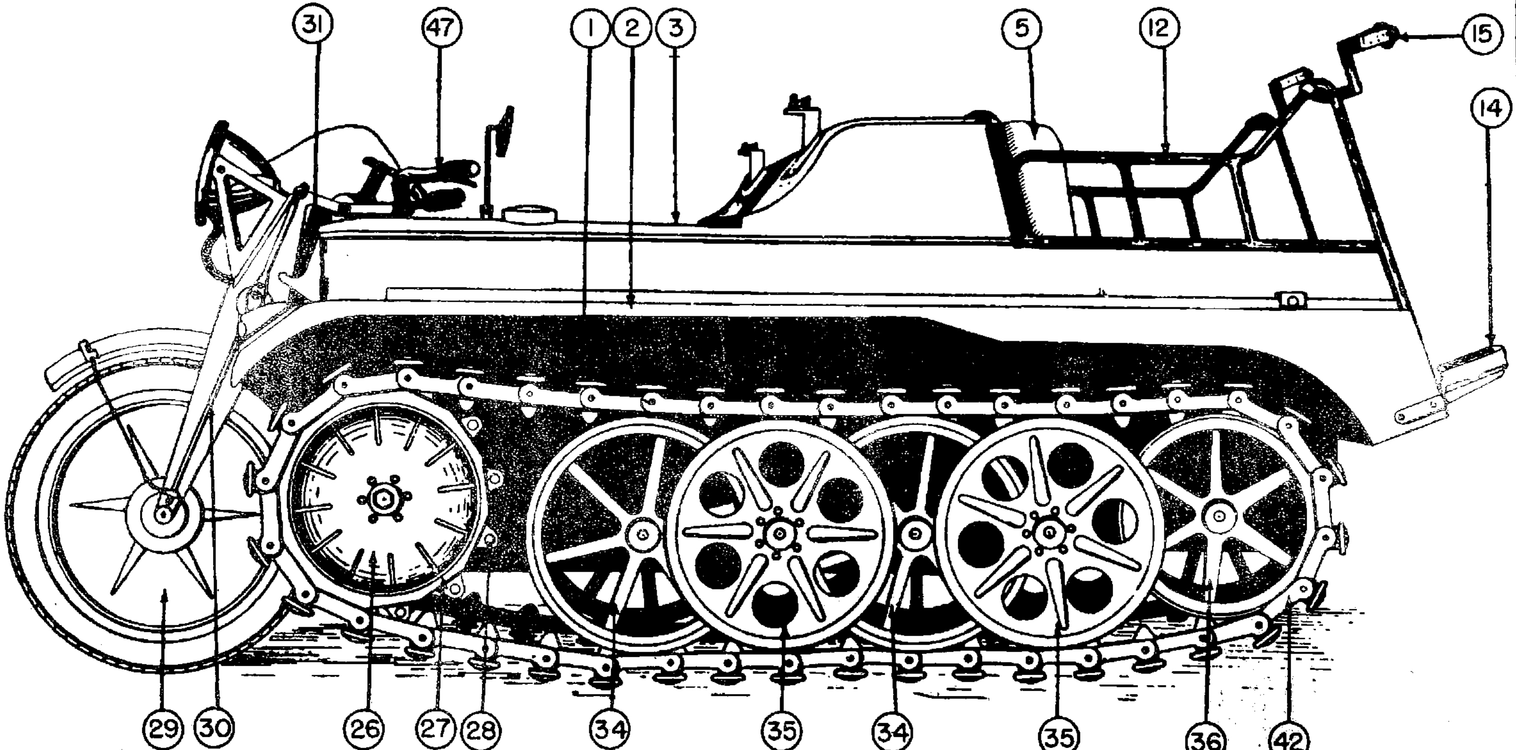
Bore	80 mm
Stroke	76 mm
Engine capacity	1,478 cc
Compression ratio	6
Firing order	1 - 3 - 4 - 2

The engine body is in two main parts: the cylinder head, and the cylinder block and crankcase (both in one piece).

c. Crankshaft Assembly

This is supported in four main bearings. The pistons are of light metal and are fitted with two compression and one oil-scraper rings. The wrist or piston pins are full floating and are prevented from sideward movement by locking rings on each side.

d. Valve Operation



MOTOR-CYCLE TRACTOR

The overhead valves (one intake and one exhaust for each cylinder) are operated by pushrods and rockers from the camshaft, which is mounted in four bearings in the crankcase. The gasoline pump, tachometer, oil pump, and distributor are all driven from the camshaft.

Valve clearance (warm)	Intake	0.2 mm (8/1000 in)
" "	Exhaust	0.3 mm (12/1000 in)

e. Cooling

An impeller-type water pump, together with the generator, is driven from a master pulley on the free end of the crankshaft and circulates water between the engine and the radiator (6), which is located at the rear of the vehicle. A small water tank is mounted above the pump.

The laminated radiator is built in a large airduct (16), in which there is a fan (17) driven direct from the crankshaft. The rear end of the airduct may be closed by a flap (18) operated by a hand lever on the left of the driver.

f. Lubrication

Oil is pressure-circulated by a gear pump from the sump through a strainer and passes through the bearings of the crankshaft, connecting rods, camshaft, tappets, and valve rockers at a pressure of 30 to 45 pounds per square inch. Piston pins and cylinder walls are splash-lubricated.

In order that the oil pressure may not rise too high, there is an excess-pressure valve in the wall of the oil pump, and this returns some of the oil to the sump.

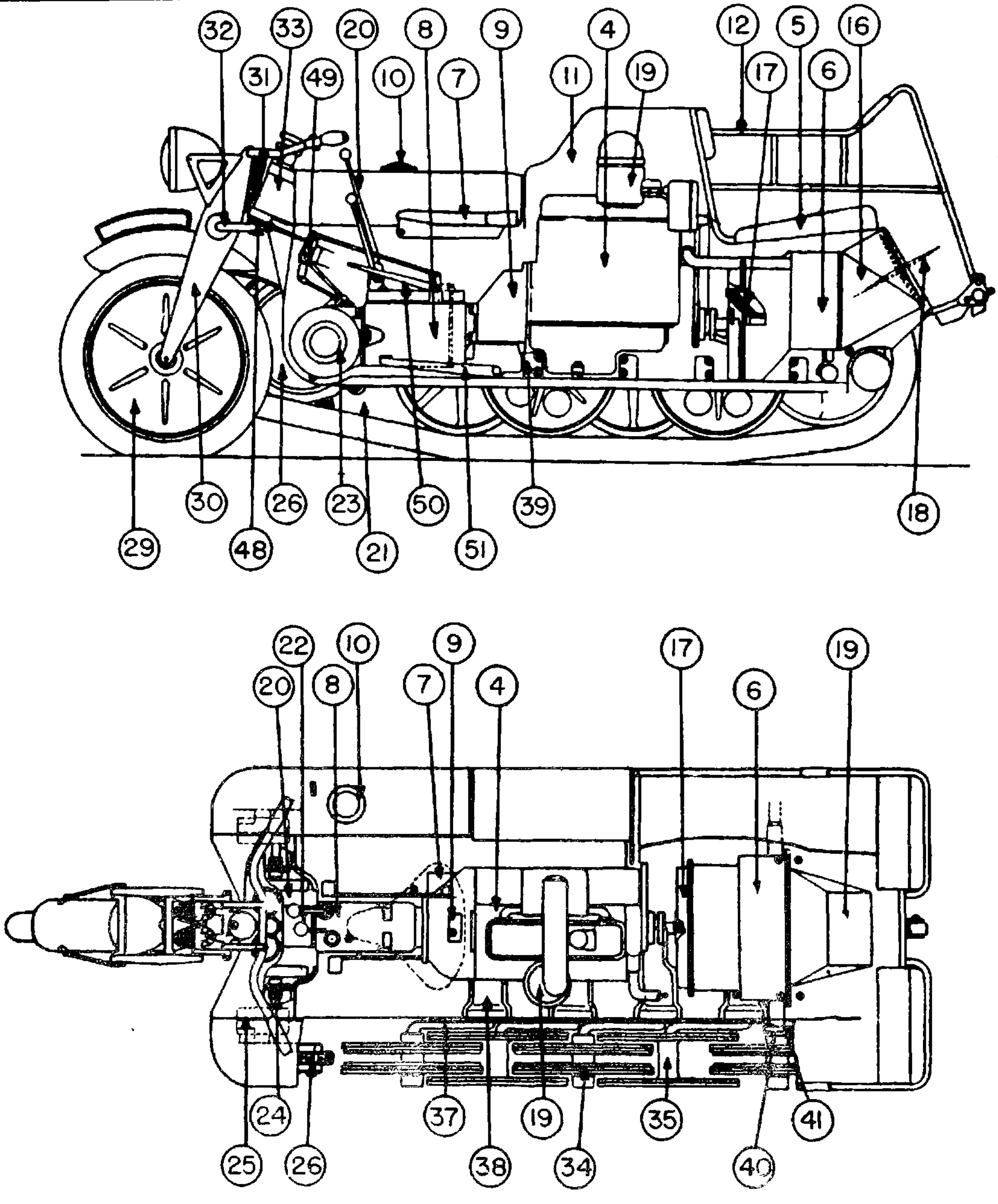
An oil cleaner of the metal-disk type is fitted. This is itself cleaned by turning the ratchet on the top.

g. Fuel-Supply

An Opel downdraft carburetor, with a large oil-bath-type air filter (19) on the air intake, is fitted. Gas is drawn from the tanks (of which there are two, each holding 5.5 U.S. gallons) and fed to the carburetor by a mechanical diaphragm pump of normal design, which is driven from the camshaft.

h. Electrical Equipment

Ignition is by Bosch coil and distributor, the latter being driven from the camshaft. A Bosch 75-watt generator, with voltage regulator, is mounted on the right side of the engine and together with the waterpump is driven by a V-belt from the master pulley. A Bosch starter motor is also fitted on the right side. The 6-volt battery is mounted on the right side above the track-guard.



GENERAL LAYOUT

MOTOR-CYCLE TRACTOR

i. Starting Equipment

Normally the engine is started by a self-starter controlled by a pull-knob on the dashboard. A crank is also provided and, for use, is inserted in an opening in the radiator grill at the back of the vehicle (just above the trailer coupling) and pushed through to engage with the crankshaft.

j. Transmission

Transmission is through an Opel multiple-spring, single dry-plate clutch, mounted on the flywheel, to a 3-speed-and-reverse gearbox (8), which also incorporates an auxiliary gear box, giving high and low ratios so that in effect 6 forward speeds may be obtained. A long gear-shift lever (20), held near the top in a gate (the H-shaped aperture in which the gear lever operates) on the dashboard in front of the driver, gives the main gear selection, while a shorter lever (21), to the rear of the first, gives selection of high and low ratios for road or cross-country travel. A hinged latch which covers the "reverse" part of the gate prevents accidental engaging of that gear, while an extension of the latch beyond the hinge makes its removal an easy matter.

The vehicle must be stationary while changing ratio in the auxiliary gearbox.

The speedometer is driven from the gearbox.

k. Differential

The differential (22) is of the controlled spur-gear type and incorporates two steering brakes (23), one for each track. These are internal expanding, and in order to increase their braking efficiency the drums are not directly fastened to the axle shafts, but are driven at considerably greater speed from the differential spur pinions through a set of gears.

l. Sprocket

From the differential, the drive passes through the steering brakes (23) and metal couplings (24) to the final reduction gears (25), and thence to the sprockets (26). Each sprocket is a narrow twin-rimmed wheel, of which the inner and outer rims are shod with rubber pads (27) (12 per rim) to form a continuous tire. The pads have the same inside curvature as the rim, but are flat outside. Adjustable rollers (28) (12 per sprocket) are fitted between the rims to act as teeth and to engage the track. An internal expanding brake, which is foot operated, is mounted inside each sprocket.

m. Suspension

(1) Front Wheel

The front wheel (29) is a pressed-steel disk type with a 3.5- by 19-inch tire (tire pressure 34 lbs. per sq. in.) and mounted in a pressed steel, motorcycle front-wheel fork (30) of conventional pattern. The springing (two vertical coil springs)(31), with controllable friction-disk shock absorbers (32), and the steering column (33) are very similar to those of a normal motorcycle.

(2) Track Assembly

The track assembly, which is of the usual type for half-track vehicles, consists on each side of a driving sprocket (26), four equal size, double-rimmed bogie wheels (34 and 35), and an idler wheel (36). Of the bogie wheels, the odd numbers (34) (from the front) are narrow wheels with radial spokes, while the even numbers are wider, pressed-steel disk wheels. The former run between the rims of the latter, the whole bogie and idler system being set rim to axle.

The bogie wheels are mounted on bell cranks (37) fastened to torsion bars, which pass across the body of the vehicle in crosstubes (38) of circular section and are anchored in the opposite side. The torsion bars of the corresponding bogie wheels of the two sides are carried one above the other (39) in the same cross tube.

The idler is simply another narrow-rimmed bogie wheel and is carried on an eccentric arm (40) which can be adjusted by a screw rod (41) passing through a bracket on the body. By this means the position of the idler can be varied, and hence the track tension may be adjusted. The bogie and idler wheel rims have thin, solid rubber tires. There are no return rollers, the track returning along the tops of the bogie wheels.

n. Track

Each track is made up of 40 forged steel links (42) (fig. 1) joined together by a bolt (43). These link joints are lubricated from oil chambers (44) which also, in part, form the tongues of the track links and pass between the rims of the bogie wheels. Above the oil chambers and track bolts, rubber shoes (45) are mounted. These are easily replaceable, being retained by 4 screws (46) only.

o. Steering

The motorcycle tractor is steered by the front wheel, by handlebars (47) in the normal manner of a motorcycle, and for sharp turns, by the steering brakes, operating on the tracks.

Two take-off rings (48) at the bottom of the steering column are connected by rods to arms on the brake crosstube (49). These in turn actuate levers, the ends of which are joined by means of adjustable rods to the steering brakes (23).

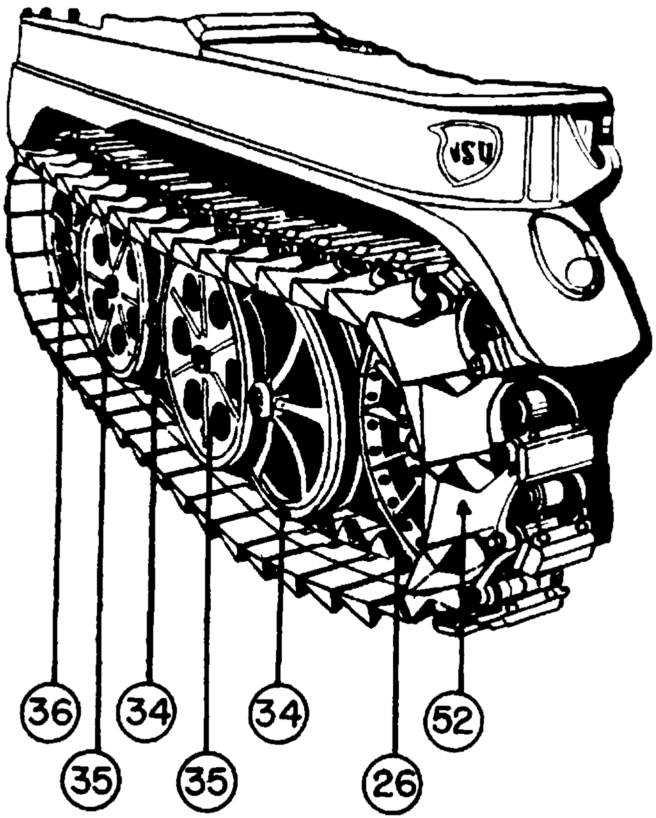


Fig. 2

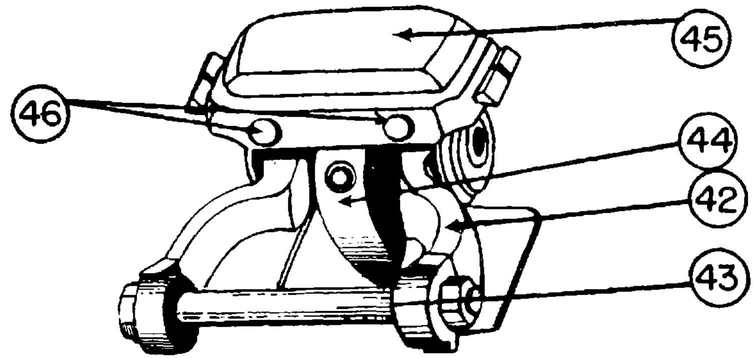


Fig. 1

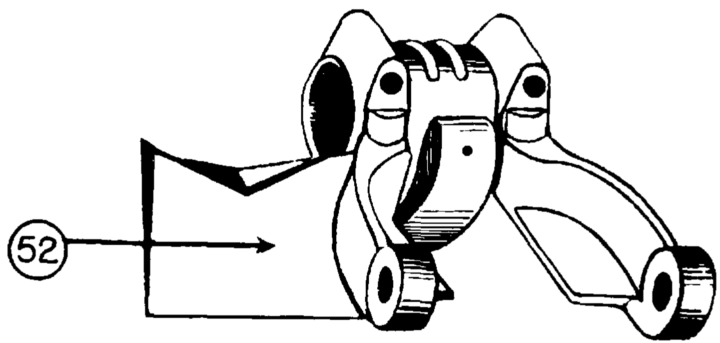


Fig. 3

TRACK OF MOTOR-CYCLE TRACTOR

The steering brakes come into play for turns of over 5°, corresponding to a movement in either direction of about 1 3/4 inches at the ends of the handlebars.

p. Brakes

The footbrake, which is located on the right, and the handbrake (50) both operate an internal expanding brake mounted in each sprocket.

q. Driver's Controls and Instruments

These consist of the following:-

(1) steering handlebars with right hand throttle twist grip;
(2) main and auxiliary gear selection levers;
(3) a footpedal (51) on the left, operating the clutch;
(4) a handbrake (50) mounted on the left of the gearbox cover;
(5) a footbrake on the right;
(6) a radiator shutter control on the inside of the body, left of the driver, -

together with starter button, ignition and lighting switches, tachometer, speedometer, odometer, oil-pressure gauge, and water-temperature gauge.

r. Modifications for Tropical Use

A German document details several modifications which are made to the motorcycle tractor to fit it for use under tropical conditions.

(1) Engine

The oil filler cap has a linen hood tied over it, and the breather pipe has a steel-wool filter held between two pins near the bottom. For cleaning purposes, the filter may be removed after the lower pin has been extracted.

(2) Cooling

In order to provide sufficient cooling, the fan is driven at 1.4 times the crankshaft speed.

(3) Fuel Supply

The Opel carburetor is replaced by a Solex model, believed to be of the duplex downdraft type. A filter is incorporated between the gas tanks and the pump.

(4) Air Filter

The "Knecht Tornado" air filter fitted to the normal vehicle is replaced by a similar type of oilbath filter, incorporating a mechanical precipitator on the inlet side.

(5) Electrical Equipment

A new generator is fitted, while a solenoid-operated starter motor replaces the mechanically operated type fitted in the normal model. The starter push button is located on the right side of the body level with the driver's seat. The distributor is enveloped in a linen bag.

(6) Transmission

Both main and auxiliary gear levers have linen hoods tied to them to cover their points of entry into the gearboxes. The breather holes in the gearboxes, the steering brakes, and the stub axle housings are all covered with cloth hoods.

(7) Tracks

For special purposes, tracks in which the links have extension plates (52) welded to their outside (figs. 2 & 3) are provided. These are probably for use in very loose sand or swampy ground.

(8) Brakes

The covers of the track brakes have extension plates welded to the upper halves to prevent the entry of sand as much as possible.

(9) Controls

The throttle twist grip is covered with a linen sheath which is tied to the grip at each end and to the handlebars, with sufficient free cloth allowed between these fastenings to permit full movement of the twist grip.

(10) Additional Equipment

A 0.4-gallon container for distilled water, and a gallon tank for radiator water are fitted.

A length of wire (16 to 20 feet) and a 13- by 16-foot tarpaulin complete the special tropical equipment of the motorcycle tractor.

s. Further Particulars

(1) Dimensions

Length, over-all	9 ft 0 in

Width, over-all	3 ft	3 in
Height, " "	3 ft	11 in
Width between tracks	2 ft	8 in
Wheelbase, from center of front wheel to center of track	4 ft	5 in
Length of track in contact with ground	2 ft	8 in
Belly clearance		9 in

(2) Weight

Without load	2,690 lbs
Loaded	3,470 lbs
Axle load, front wheel	120 lbs
Load on tracks	3,248 lbs

(3) Performance

Maximum speed on roads,	
At 3,000 rpm	38 mph
At 4,000 rpm	51 mph*
Trailer capacity	1/2 ton (approx)
Maximum gradient, loose sand	
Without trailer	24° (45% or 1 in 2.25)
With trailer	12° (20% or 1 in 5)
Depth of water forded	1 ft 7 in
Fuel capacity	9 gal
Gasoline consumption,	
On roads	17 mpg
Cross-country (approx)	12 mpg

* This speed, it is stated, is only to be attempted in exceptional circumstances.

QUARTERMASTER

20. BRITISH SUPPLY PROBLEMS

The problem of the requirements of an army on the move, especially where long distances are involved, brings into play various types of transportation to furnish supplies and equipment. It has been said that over half the planning on any tactical problem must be that of the supply aspects, including computations for the use of every truck, vehicle, and available piece of equipment.

A display of divisional equipment and ammunition, recently held in England had, for its purpose, the object of presenting the scope of the logistic problems to the General Staff of the British Army. A correspondent gives an account of a visit to a British Ordnance Depot in an article which appeared in the December 13, 1942 issue of the London Sunday Times. As a matter of interest to supply branches other than Ordnance, this article is reproduced here.

*   *   *

Since the last war, the great increase in fire-power of a British infantry division has brough many complex problems of supply in its train. It has been estimated that a division, about 12,000 men, needs well over 100,000 packing cases to take its fighting equipment alone, without taking into account foodstuffs, clothing, or medical supplies.

These difficulties are strikingly illustrated in an exhibition, the only one of its kind in the country, which I saw yesterday at a great ordnance depot. It displayed every kind of fighting equipment used by various types of divisions, from the rifle bullet to the big shells, from machine guns to the 25-pounder, and the newest types of mortar and antitank gun.

The exhibition has been got together by the War Office to show officers at a glance the problems of organization, supply, and maintenance to be solved when an army is on the move.

Successful efforts are being made to economize space on ships. Motor vehicles and weapons are frequently taken apart so that they can be packed into a much smaller space. This was not done in French North Africa, where the material had to be got ashore within easy range of enemy bombers and it was essentialfor the vehicles to move off quickly, but it is done regularly at ports where the unloading can be carried out free from enemy interference and where time is not precious.

It should be stressed that a weapon which weighs, say, 10 tons on land may be reckoned as 50 ship-tons, for aboard ship tonnage is calculated on the space occupied. Thus a couple of motorcycles, packed away in parts, will save 5 ship-tons, and a couple of trucks 20 ship-tons.

It is estimated that a British division needs at least 80 trains to move it from one area to another. On the road its trucks are numbered by the thousand.

Wide Equipment Range

The range of equipment is astonishing when one considers how little of it existed at the outbreak of war. I saw weapons and equipment which are still closely guarded secrets.

An infantry division carries every conceivable type of radio, but most striking of all is the little set that can be carried on a soldier's back and enables him to converse freely with a neighboring unit amid the noise of battle. The secret is that the soldier does not talk into a mouthpiece at all. Round his throat is a very delicate piece of apparatus and as he speaks the tiny movement of the throat muscles convey the message to the listener.

I saw, too, mechanical wire layers which can trundle along at 22 miles an hour, which would make the signallers of the last war open their eyes.

When this war began, the British Army had no equipment for mountain or winter warfare. To-day it can vie with the Russians in the variety and practical value of its equipment.

The machines which it uses in desert warfare are well protected from the sand particles, while tanks which have to wade ashore from the sea have every working part protected from the salt water.

Self-Heating Soup

The comfort of the fighting soldier and his efficiency are now regarded as synonymous, and much has been done to provide him with hot food under the most trying conditions.

Self-heating soup is a brilliant little idea. The men waiting in the assault boats on a cold morning are given a tin of this soup. The glowing end of a cigarette applied to the tin ignites a solid fuel at the base, and in 5 minutes or less, appetizing hot soup is available.

Food for many hours can be packed into a mess tin, and is both varied and palatable. The iron ration is no longer bully beef and biscuits.

Every type of artillery is gradually increasing in caliber, and rapidly in numbers. Veterans of Mons who remember the two machine guns per battalion of the 1914 B.E.F. would be amazed at the wide range of types.

Also, the types of armored fighting vehicle are many.

Mine detectors are available for all types of terrain. I saw one which

the soldier pushes in front of him; when the apparatus touches a mine, a buzz in the headphones gives him warning.

Then there are the enormous number of working parts for each weapon. The 25-pounder, the best field-gun in the world, has 228 items of which 32 are essential, while the Bofors AA gun has 189.

* * *

21. REVERSIBLE UNIFORMS

A new three-part uniform has been issued to German troops on the Eastern Front, according to Swedish newspapers which quote Berlin. It consists of a hood, which may be pulled over the steel helmet, a coat, and breeches. Field-gray on one side and white on the other, the uniform may be reversed and used as camouflage.

The Japanese are also reported to have devised a reversible uniform in different colors for camouflage purposes.

SIGNAL CORPS

22. BRITISH SIGNAL SECURITY IN NORTH AFRICA

Radio, when properly used, furnishes a valuable means of signal communication. It is used for both tactical and administrative messages by all units of a modern army. It is an essential means for highly mobile elements such as aircraft and armored units, and is especially useful for control of motor movements and for dealing with fast moving situations.

One of the chief disadvantages of radio communication is that radio intelligence is one of the enemy's best methods of obtaining information of our plans, dispositions, and operations. In order to provide the necessary signal security a high state of training is required of all personnel. In North Africa the British have come to understand the importance of proper security measures in radio communication. In one compaign, security measures were poor and, as indicated below, valuable information fell into enemy hands. In a later campaign, corrective measures were taken; many of the earlier failings in the British signal security were remedied by the introduction of new procedure, combined with the reduction of traffic in the clear.

a. Lack of Signal Security

The following weaknesses in British signal security in one of the

earlier campaigns resulted in the enemy acquiring valuable information on the strength and disposition of British forces and on their future plans.

(1) The enemy found it impossible to predict a certain attack from an examination of requests for supplies. The sudden increase in requests for rations, fuel, and ammunition indicated the imminence of an attack. It was this extra supply traffic, combined with the German knowledge of the code call system, which enabled the enemy to anticipate the attack, and to make the necessary dispositions to meet it.

(2) The exact location of British unit positions was made easier by one station asking another to call back at a prearranged time.

(3) The identification of units was often made much easier by the constant repetition of names and code references, and the almost complete lack of security measures in conversation under conditions of bad communication.

(4) Carelessness in the use of plain language, especially under battle conditions, allowed information to escape relating to matters as important as command and operation plans.

(5) The practice of giving the coordinates of enemy positions in the clear was of value to the Germans by giving them information as to:

(a) The exact location of their own troops.

(b) The general location of British troops, since the report of the position of enemy forces obtained by visual observation necessarily gives the approximate location of the reporting unit.

(c) British intentions. The traffic between two British stations included reporting in the clear locations of enemy tanks, followed by a reply stating an intention to attack then or at a prearranged time.

(6) From the number of captured British codes and documents found in enemy possession, it was evident that the practice of forwarding a code name or list to all units in a division, and of showing the complete distribution list, has proved of great value to the enemy in determining the exact British order of battle.

b. Success of Signal Security

The effects of improved methods were most clearly seen at the time of a later British offensive. The Germans were unaware as to whether British preparations were offensive or defensive, nor did they know either the time of the attack or the strength of the forces employed.

This lack of information was attributed to the new signal procedure, increased radio security measures, the observance of radio silence by units arriving in their assembly areas, and the fact that no special supply preparations were identified.

SECTION II

"DANGERS" OF THE TROPICS

"DANGERS" OF THE TROPICS*

To Europeans and Americans whose traditions and experience are mainly associated with lands in the temperate zones, the Tropics have taken on a glamor or an atmosphere of terror far beyond that warranted by the actual differences between the two areas. Professional travelers, fiction writers, and others have exaggerated both the enchanting and the bad features of the Tropics. By placing particular stress on the latter they strive to enhance their own heroism and fortitude at the expense of literal truth. Much of the distortion of facts comes from picturing conditions in many tropical regions as they were long ago, with the implication that the same conditions exist today. The situation is similar to that in many parts of rural France, where even today one may find people who firmly believe that a trip from Washington to Philadelphia is fraught with great danger of attack from savage Redskins. This belief is no more absurd than that of a large portion of our own population to the effect that the traveler in equatorial Africa is in constant danger of capture by cannibalistic natives or of attack by blood-thirsty wild animals. Knowledge of conditions in the Oceanic Islands is probably even more distorted.

Most Americans, especially those born and raised in the city, are far enough removed from their pioneer ancestors to have lost the knack of taking care of themselves under any and all conditions, and it would be foolish to say that, without any training, they would be in no danger if lost in the New Guinea or some other Pacific island jungles. On the other hand, however, they would be in just as great danger if lost in the mountains of western Pennsylvania or other portions of our own country. The only difference is that there would be less tendency for a person to become panicky if so lost in his homeland than if it occurred abroad, because he would not be haunted by recollections of hair-raising tales of adventure. Actually there is no more reason to be afraid under one set of circumstances than the other, and neither here nor abroad are the conditions such that one need lose his head or become unduly concerned over his situation.

Popular literature is filled with references to poisonous snakes, man-eating crocodiles, savage beasts, noxious insects, blazing heat, torrential rains, and poisonous plants and trees. If the daring soul who ventures into the Tropics survives all these and is not decapitated by headhunters and eaten by cannibals, he is pictured as returning home wasted by fevers, his nerves completely shattered by his terrible experiences, in fact only a fragile husk of his former virile self. By way of reassurance to those who do not know the Tropics at firsthand, it might be well to review some of these popular "perils" more closely.

SNAKES

One of the first questions asked the tropical traveler is "how about

*Prepared in the Smithsonian Institution, this article is written by an authority on the area discussed and is based on scientific, firsthand experience.

snakes?" The popular writer-lecturer-Sunday-supplement explorer is prone to picture the jungle traveler as one who proceeds warily with one eye turned upward to watch for pythons or boa constrictors hanging from limbs awaiting the chance to cast their coils about the body of an unwary wayfarer, while the other eye searches the ground to spot the venomous snakes lurking in the grass ready to sink a pair of poison-drenched fangs into his lower extremities. The truth of the matter is that, unless he is a trained student of the science of reptiles, the jungle traveler will do well if he sees more than one or two snakes a month--and when he does, the view will probably be fleeting, as the snake most likely will be making every effort to disappear. There are no land snakes in the more remote Polynesian islands, and there were none in Hawaii until a minute, wormlike blindsnake was accidentally introduced there in recent years. Most of the islands of the East Indies have both venomous and non-venomous types. There are four kinds of snakes on the Fiji Islands, including one venomous variety. There are many kinds on the Solomon Islands, and Australia has an abundance of them, but nearby New Zealand has none. Only harmless kinds occur in the Galapagos Islands.

The poisonous snakes in New Guinea and the large neighboring islands are relatives of the Indian cobra, and their venom affects the nervous system (in contrast to the North American poisonous snakes, whose venom affects the blood stream). If one should inadvertently step on one of these snakes, a bite would most probably be the result. The chances of this happening to people traveling along trails or waterways are probably about the same as those of being struck by lightning. One large party, composed of some 700 men, traversed a considerable area in New Guinea some years ago and in a year's time did not have a single person bitten by a snake. New Guinea is as well infested with poisonous snakes as any part of Melanesia, but it probably is less dangerous from this source than New Mexico, Florida, or Texas, for example. This is not to say that one should be utterly careless of the possibility of snake bites, but ordinary precautions against them are sufficient. When natives are bitten, it usually happens when they are clearing new land for their gardens. One should be particularly watchful when clearing ground for a camp site, trail, or the like and also when roaming in the brush gathering fire wood. While most of the snakes in New Guinea, Australia, and neighboring large islands are non-venomous, the safest procedure is to regard all of them as poisonous and to treat any bite accordingly. There are pythons in New Guinea, but even if they would attack a human being--which they will not do--there is no snake of the constrictor variety in this region large enough to harm a man.

CROCODILES

"Crocodile-infested rivers and swamps" is another catch phrase of the Tropics. New Guinea certainly has its share of crocodiles, but authentic cases of their attacking human beings are practically impossible to find. Occasional rare instances are reported where an old and very large crocodile unable to catch its normal food has acquired the habit of preying on people.

The bite of a crocodile is weak, as it does not masticate its food but swallows it whole. No crocodile would attempt to attack any man or animal too large to swallow. To swallow a small man, a crocodile would have to be at least 15 or 16 feet long, a size rarely seen. There is no need to fear a crocodile's teeth, formidable though they may appear, but if approaching or attempting to kill one along the shore, care should be taken to avoid the sweep of its tail. They can move very swiftly, and the powerful tail is heavy enough to break a man's leg.

WILD BEASTS

Another favorite theme of the professional traveler is that of the dangerous wild animals. This probably is the most fallacious idea of all. In Africa where lions, leopards, and such carnivorous beasts abound, it usually is necessary for photographers and others to obtain pictures of them on the large preserves, where the animals roam about as do the bears in Yellowstone National Park. In areas where the beasts are not protected, they are shy and seldom are seen without the aid of experienced guides. When encountered, the one thought of the beast is to escape. All large animals, of course, can be dangerous if cornered or if they are suddenly startled at close quarters. This is especially true for females with young. The chances of this happening, however, are remote. The idea that big game hunting is dangerous is largely bunk. There are no carnivorous animals in the South Pacific, but in Sumatra, Bali, Borneo, and southeastern Asia there are tigers. There again, it takes a skillful hunter and some luck to see one. The rare instances where human beings have been attacked were the result of old animals, unable to obtain their normal food, being forced to attempt to get a native.

INSECTS

Tropical insects as a rule have had their noxious nature greatly overstressed, and the tenderfoot often has undergone much needless worry on that score. They do abound, however, and some varieties may act as transmitters of disease. Ordinary precautions should be taken against them, but they should not be regarded in the sense of a great peril. Mosquitoes generally are the most prevalent kind of noxious insect, and in many cases they are carriers of malaria; hence their bites should be guarded against. In the Southwest Pacific area, malaria is an important problem. Since malaria mosquitoes generally fly only in the evening and at night, the best way to escape infection is to get under a net or into a screened enclosure as soon as possible after sunset. This, of course, is not always possible for all on a military expedition. When on evening or night duty, exposed portions of the body should be reduced as much as practicable. Malaria itself is not as terrifying an affliction as it is usually described to be. It is decidedly uncomfortable but, with modern medicines and methods of treatment, it rarely becomes a critical ailment. In localities distant from human habitation, no disease should result from mosquito bites. Mud packs offer some relief from the itching which they cause.

Wasps and bees may be abundant in some places, but will rarely attack unless their nests are interfered with. In case of stings, mud packs are very helpful. In some areas there are tiny bees, called sweat-bees, that may collect on exposed parts of the body in enormous numbers during dry weather, especially if one is perspiring profusely. They are stingless and, until one has completely stopped sweating, the only thing to do is to scrape them off with the hand, hundreds at a time. The honey made by these bees is not edible, as too much perspiration goes into its composition. The larger centipedes and scorpions can inflict painful but not deadly stings. These creatures like dark, warm places, so it is always advisable to shake one's blankets before turning in at night, and to make sure that none are hidden in the clothing or shoes before dressing. Spider bites may be painful but are rarely serious, and as a matter of fact are not often incurred. Ants are a remote, although possible, source of danger to injured men lying on the ground and unable to move. This should be borne in mind in placing wounded where they may have to remain for some time.

In some localities certain butterflies collect to gather perspiration from the human body in dry weather. They are somewhat annoying but quite harmless. In Indo-Chinese countries the rice-borer moth of the lowlands collects around lights in great numbers during certain seasons of the year. It is a small, plain-colored moth with a pair of tiny black spots on the wings. It should never be brushed off roughly, as the minutely barbed hairs of its body may be ground into the skin, causing a sore much like a burn that often takes weeks to heal.

LEECHES

Leeches are common throughout most of the islands in the Southwest Pacific, and the Malay Peninsula. They are found in swampy areas, streams, and moist jungle country. In these areas they are found not only in the water but also clinging to vegetation. They are not poisonous, but their bites may become infected if not cared for properly, and the small wound* that they cause may provide a point of entry for the organisms which cause tropical ulcers or "jungle-sores." One should watch for leeches on the body and brush them off before they have had time to bite. When they have taken hold, they should not be pulled off forcibly, but rather made to release themselves and drop off by touching them with a moist cud of tobacco (this is especially effective if some red pepper is mixed in the tobacco), by touching them lightly with the burning end of a cigarette or a coal from the fire, or by dropping some alcohol on them. Leeches try to reach mucous membranes and frequently enter the rectum or penis without attracting attention until an itching sensation begins. Urination usually removes them immediately from the penis, but medical help may be needed to remove one from the rectum. After being satiated, however, leeches frequently leave the rectum with an evacuation. This may produce a certain amount of blood flow that may be mistaken for the beginning of dysentery, but

* In this connection, it may be cited here that open sores and scratches can become easily infected in the Tropics, and measures for disinfection should be promptly taken.

its short duration will remove all fears on that score.

POLLUTED WATER

Dysentery, which with malaria constitutes the twin ailments of the Tropics, is usually acquired through drinking polluted water. Pollution has nothing to do with the clearness or muddiness of the water. It is the result of contamination by human beings, and much of the water is polluted. Water from all "lived on" small streams or native wells should be avoided. The muddy water of large rivers frequently can be used with safety. The safest procedure, of course, is to boil all drinking water, at least 20 minutes to be on the safe side, unless the purity of the source can be ascertained with certainty.

POISONOUS PLANTS

Another category of fictitious dangers lies in the poisonous plants and trees. Such tales are of all degrees of frightfulness, from the man-eating Madagascar tree to the legendarily deadly Upas tree which, while incapable of affecting men or animals at a distance -- a trait attributed to it by Javanese tradition -- contains a sap which is poisonous when used on the projectile points of the natives. The truth of the matter is that nettles, particularly tree nettles, are about the worst that one will encounter, and one stinging from this source is sufficient to educate the victim to a ready recognition of the plant so that the mishap does not occur again. There are some trees, called Ringas by the Malays, the sap of which affects some people in much the same way as poison oak. Our own poison ivy and poison sumac, however, are much worse and much more likely to cause trouble. Danger from poisonous plants is much greater in Golden Gate Park, San Francisco, or in the woods of our own eastern seaboard, than it is in New Guinea or the Tropics anywhere. Thorny thickets, such as rattan, should be avoided as one would avoid a blackberry patch.

CLIMATE

Tropical climate is also frequently maligned. It is true that the climate as a whole is much warmer than that of the temperate zones, but it is not because one gets so much hotter in the Tropics than elsewhere that the idea of excessively high temperatures has gained credence; rather it is because the heat is more continual and persistent. In regions where the air is humid, the heat may seem more oppressive than it actually is. As a matter of fact, however, tropical travelers often complain that they have never experienced such heat and discomfort in the "jungles" as in some of our own cities in the summer time -- Washington, D. C., for example. Conversely, there may be more suffering from cold in the Tropics than from heat. Of course at ordinary altitudes low temperatures do not occur, but chilly days and nights are far from uncommon. At higher levels the nights may even be cold. The contrast between hot days and cold nights, however, is not as marked in forested areas as in the desert.

Tropical rain is another subject generally mentioned. It certainly is true that precipitation in many parts of the Tropics is much greater than that in all but a few areas of the temperate zones. Tropical downpours usually are followed by clear skies, and in most localities the rains conform to a fairly predictable time table. Except in a few areas where the fall may be continous during the rainy season, there are not many days when the sun does not shine part of the time. Residents of the Tropics usually plan their activities so that they are able to stay under shelter during the rainy and hot portions of the day. After becoming accustomed to it, most tropical dwellers prefer the mild and equable climate of the torrid zones to the vagaries of more northern climes.

CANNIBALS AND HEADHUNTERS

New Guinea and the Solomon Islands are popularly believed to be the haunts of headhunters and cannibals. Fifty years ago this was true, and it is true today in much lesser degree in certain areas. A considerable portion of the interior of Dutch New Guinea is occupied by hostile tribes that are likely to be dangerous to small parties. This is particularly true of the natives of the interior lake plain. They are armed only with bows and arrows and are so excitable that they are prone to reveal intended ambushes by shouting or firing their arrows too soon. If attacked, a small force armed with modern weapons should be able to disperse them without serious difficulty. There still may be places in the interior of British New Guinea where the natives are treacherous, but for the most part these have been brought under control. Headhunting and cannibalism are usually practiced at the expense of traditional enemy tribes, although strangers occasionally may be attacked without provocation. For the most part, whites can get along with natives by treating them with the same respect that would be given peoples in civilized countries. This involves respect for privacy and personal property, and the observance of local customs and taboos. One should not enter a native house without being invited, nor should fruits be picked or sago trees cut without ascertaining their ownership, gaining permission, and paying for them. If one is tempted by the women of the wild tribes (and not many are likely to be), a case of venereal disease can be expected as a follow-up, this being one of the "benefits" of civilization conferred by the whites.

Apart from New Guinea, the Admiralty Islands are about the only other region in which the natives have a bad reputation. This of course refers to unprovoked attacks. Any natives may be dangerous if badly or unjustly treated, or if undue liberties are taken with their women without regard to local custom.

Those about to experience the Tropics for the first time will soon learn these facts for themselves, but a little advance knowledge may relieve them of some concern.

CORRECTIONS

CHEMICAL WARFARE

No. 14, p. 15: Reference was here made to a German "TB" hand-thrown, prussic-acid grenade. This was an error, as this is the Japanese "TB" grenade, a prussic-acid-filled glass cylinder. The Japanese "similar type" grenade also referred to is this same "TB" grenade.

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TACTICAL AND TECHNICAL TRENDS

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SECTION I

AIR

1. JAPANESE FIGHTER TACTICS

Japanese fighter tactics against both Allied fighters and bombers necessarily vary both with the number and type of aircraft encountered, and with the conditions under which attacks are executed. The normal tactical unit is a squadron of nine planes subdivided into three flights, in either Vee or echelon formation. Another frequently employed formation consists of a Vee of three fighter aircraft, flanked by echelons of two fighters. The latter formation is customarily used for ground attack, the echelon pairs meeting the fighter opposition while the Vee goes in to attack. The fighter formations usually fly at altitudes of 15,000 to 20,000 feet, but are said to operate efficiently at 27,000 feet or higher.

Japanese fighter pilots generally avoid head-on attacks against Allied fighters, probably because most of their planes are unarmored. "Head-to-tail" attacks are favored, except when engaging bombers with rear guns. Contrary to an earlier belief, the Japanese appear to prefer single to concerted attacks. They are now following our fighters into power dives, which heretofore they were reported reluctant to do. Apparently the structural strength of the new Hap, in particular, has made this method of escape for Allied aircraft less effective.

Attacks against our fighter aircraft have been most frequently made from above and the side, and, if possible, out of the sun. Recently, Japanese fighters are reported to be making a series of tight turns and then climbing steeply for a head-on attack. After attacking, they do a turn resembling an Immelmann, climbing up and flipping over to a half roll at the top of the loop. When pursued by our fighters, they frequently resort to evasive action, while pulling into Immelmanns and loops.

In the Aleutians, it has been observed that a Japanese Rufe, when given the advantage of altitude in a head-on attack, dives on his opponent and levels off just out of firing range. He usually rolls on his back as he passes over the Allied plane, and does a snap roll onto our fighter's tail. According to many observers, the moment of greatest vulnerability for the Japanese pilot is during the pull-out from a head-on attack, since our fighters are afforded a good shot when the enemy aircraft is in the process of making a slow roll or a climbing turn. When a head-on attack is not possible, Japanese fighters sometimes attempt an Immelmann or a steep chandelle before diving onto the enemy.

When a Japanese fighter approaches an Allied fighter aircraft broadside, from below, or at the same level, he fires a short burst and does a semi-half roll, usually to the left. He then comes back up in a steep climb and attacks again. When a climbing attack is made on a Japanese fighter, he remains just out of range until the pursuing plane begins to stall. Executing a quick turn, he brings his guns to bear on the Allied plane when it is a relatively easy target.

Japanese pilots are particularly adept in employing "decoy" tactics. The fighters sometimes fly in circles, one above the other, at different altitudes. When one of the lower aircraft is attacked, the aircraft above it dive success-

ively onto the opposing fighters, usually approaching from behind or slightly below. A similar ruse has been employed by three-plane formations. When encountered by a pair of Allied fighters, the right- or left-wing pilot of the formation peels off and dives. If one of our fighters follows, he becomes easy prey for the remaining two Japanese aircraft.

In another deceptive maneuver, Japanese fighters attempt to draw our aircraft, particularly stragglers, into combat for the purpose of exhausting their fuel supply by the time succeeding Japanese fighters arrive to attack. These tactics are also used to enable Japanese bombers to carry out their missions after our fighters have been forced down. A faked dogfight is often staged to make it appear that one of our planes is engaged, so that the others will come to its rescue. According to a pilot in the Netherlands East Indies, a fighter, with Allied aircraft on its tail, decelerated suddenly by using his flaps and side slips. When the attacking aircraft overshot, the fighter came up underneath and fired on him. Smoke cartridges are also reported to be employed by Japanese pilots after beginning a spin downward to create the impression that they have been knocked out.

Escort fighters for bombardment aircraft have been observed above, below, and to the side of the bombers. In approaching their target, the bombers usually fly at approximately 25,000 feet, but have been encountered as high as 29,000 feet. The protecting aircraft may sometimes fly 6,000 feet below and about 2 miles behind the bombers, or they may fly about 10 miles to the side, below or above them or at the same level. Fighters have also been known to trail the bombers at least 10 miles, although that distance gives Allied aircraft a decided advantage. Covering aircraft have, in one instance, been reported to fly above the bombers in varying positions at altitudes as high as 35,000 feet. Fighter escort planes, however, have been most frequently encountered under the bombers; in this case, our fighters, having the advantage of speed gained in a dive on the bombers, have attacked successively the bombardment planes and the fighters below them.

Currently, Japanese pilots are attacking both heavy and medium bombers from all directions, but the frontal attack is most frequently employed against our Fortresses in order to avoid the heavy fire of their rear guns. Tail attacks, sometimes made simultaneously with bow attacks, continue to be reported, as well as beam attacks and attacks from directly underneath.

During the Battle of Midway, two enemy fighters attempted interception of two three-plane elements of Fortresses, firing first at the wing ships, rolling and taking a shot at the lead ship, falling off, and then pulling back to make successive attacks. Subsequently, one Japanese aircraft flew in the path of the bombers, but far ahead, and after about 30 minutes made a right chandelle and attacked from the frontal quarter.

An instance of rear attack was recently reported from Guadalcanal. Two floatplane fighters, probable Rufes, approached a B-17E at 10,000 feet, one breaking away at 500 yards and concentrating on the bomber's underside. A

third enemy fighter did not take part in the action, but remained about 3 miles away at the same altitude as the bomber. A second attack, also from below, followed quickly. One of the fighters went into a slow roll at 7,500 feet, pulled up into a steep climb, and aimed at the belly of the bomber. During the engagement, both fighters jockeyed back and forth, avoiding a straight approach.

A recent report indicates that Japanese fighters now attack medium bombers from a position parallel to the bombers' line of flight but at a lower altitude. The fighters chandelle up into the bomber formation, rolling out and diving down to the opposite side, from which a new attack is begun. This maneuver, which is similar to a lazy eight, is repeated again and again. Frequently employed tactics against the B-26 involve a two-element attack, one aircraft on the right and two on the left, just out of range of the bomber. The single plane turns into the bomber to block out its turret and nose-gun fire, and then passes under the B-26 to take the left flank, while the other two planes change over to the right.

In early operations, Japanese employed two principal methods of ground attack, which are still considered effective. In the first attack, fighters come in just over the trees, dive on an Allied airdrome, machine-gun grounded aircraft and antiaircraft emplacements and then fly away in horizontal formation at low altitude. In the case of one such attack, a fighter remained to circle the field at an altitude of 12,000 to 18,000 feet, apparently to observe the results of the attack. Shortly afterward, the Japanese launched a new attack, probably making use of information gained from the observation.

A second method of attack is illustrated by operations against Palembang. A Japanese fighter flew over an airfield and attacked with machine guns while one or more flights of aircraft remained at altitudes of 16,000 to 20,000 feet. When defending Allied fighters attempted to get into the air, the Japanese planes immediately dived upon them at high speed. In a similar attack, the Japanese fired tracer and, when this scored, followed with 20-mm explosive. They passed the targets at a height scarcely over 25 feet, flew about 50 yards beyond the edge of the field, and after making easy turns, repeated the attack again and again.

More recently Japanese naval floatplanes, in loose echelon formation, flew over an Allied airdrome at 5,000 to 6,000 feet, and after circling it, peeled off, and executed organized machine-gun attacks, commencing fire at 1,500 feet. The planes then pulled out in a low turn and made independent low-altitude attacks.

Timing of all attacks on ground installations has been well coordinated.

2. MISLEADING MARKINGS ON GERMAN PLANES

Two German FW 190s over England in January 1943 are reported to have carried their crosses on the wings on a gray background and enclosed by

misleading yellow roundels; the effect might have given the impression that they were friendly planes. They also carried yellow bands near the tail end of the fuselage, and vertical yellow stripes on the tail unit.

On one occasion during February 1943, five FW 190s were reported to have red, white, and blue vertical stripes on their rudders. As a result, British fighters could not immediately determine their nationality and hesitated before attacking them.

ANTIAIRCRAFT

3. GERMAN HEIMATFLAK UNITS

a. General

For the purpose of supplementing the defense of industrial areas in Germany, and to some extent in occupied countries, a civilian antiaircraft organization is reported to have been organized. It is known as Heimatflak (Home Antiaircraft Defense).

b. Organization

These units are organized within the framework of Germany's air defense system. The Heimatflak commander in each Luftgau (air district) is presumably under the jurisdiction of the German Air Force Luftgau commander responsible for the air defense of the whole area.

It appears that Heimatflak consists of fixed batteries (Heimatflakbatterien) each with its own headquarters (Batteriekommando). No details of any higher unit organization are known at present.

There are two types of battery; a heavy battery of six 75-mm (2.95-in) guns, and a light battery of fifteen 20-mm (.79-in) guns. In addition, there are balloon barrage batteries (Heimatluftsperrbatterien) each with 24 balloons.

c. Personnel

The Heimatflak personnel consists of civilians who are trained to man antiaircraft guns in the neighborhood where the civilians are employed, thus releasing regular antiaircraft personnel for duty elsewhere. They perform antiaircraft duty in their spare time, but are presumably also called out from their factories or offices during working hours in case of alarm. These men may have had no previous military training, or they may be ex-servicemen discharged from the armed forces and drafted into industrial employment; on joining the Heimatflak, the latter relinquish their former service rank, but nevertheless receive the pay appropriate to that rank.

The average age appears to be between 50 and 60, though some reports refer to young men of 16 and upwards, who in some cases are drawn from the older classes of the Hitler Youth organization.

Heimatflak personnel wear the red collar-patch of antiaircraft on their uniform and are provided with steel helmet, gas-mask, boots, overalls and cap.

d. Training

Personnel are trained under noncommissioned officers from regular antiaircraft units, and possibly by men of their own detachment who have had previous antiaircraft experience, such as ex-servicemen. It is believed that training normally takes place at local antiaircraft sites, though one instance is known of workmen being sent to pursue an antiaircraft course away from their place of employment. The average period of training is probably from 2 to 3 months.

e. Sphere of Activity

Heimatflak is presumably intended primarily for supplementing the defense of industrial areas in Germany. The organization has, however, apparently been adopted to some extent in occupied countries also, since references have been made to Heimatflak in Luxembourg and Poland.

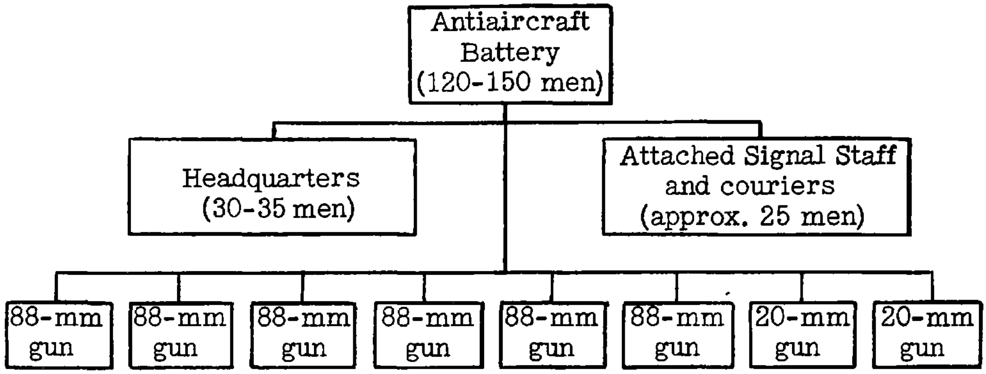
f. Conclusion

The manning of the antiaircraft defenses on the scale now believed to exist throughout Germany and occupied countries, in addition to provision for the large number of antiaircraft units operating with the field army, must involve a tremendous strain on manpower. It is not surprising, therefore, to find that an attempt is being made to ease this strain by the adoption of the policy of employing factory and office workers as part-time antiaircraft personnel. It may also mean an increase in the density of the antiaircraft defenses in areas heretofore considered inadequately defended.

4. GERMAN HEAVY ANTIAIRCRAFT BATTERY

A report has been received, based on German sources, which indicates that a German heavy antiaircraft battery usually consists of four 88-mm guns and two 20-mm guns. In some cases there are batteries with six 88's and two 20-mm guns.

The following chart shows the reported organization of a German heavy antiaircraft battery equipped with six 88-mm guns. The 88-mm guns have a crew of 10 to 12, the 20-mm gun a crew of 6.



The fire-control point, known as the Befehlsstelle or Feuerleitstelle, is placed according to the position of the battery and may be at some distance from the guns. Normally, however, it is spotted to the rear or to one side of the battery, usually at a distance of 300 yards.

The main instruments at the Befehlsstelle are the Kommandergeraet (for calculating firing data), the Entfernungsmessgeraet (for measuring distance to the target) and a Hilfskommandogeraet (for auxiliary calculations). The Kommandogeraet used by one battery reported was the K.G. 36. The K.G. 40 was also in evidence; this is similar to the K.G. 36 but has a power-operated lever. The firing data calculated by the Kommandogeraet is transmitted to the gun-pits by means of an electric indicator. The only orders passed verbally to the guns are loading and firing orders which are transmitted to the gun commanders by telephone.

During air raids on industrial towns in Germany, raid warnings were passed to the Batterie Befehlsstelle by the Untergruppe. The Untergruppe is a regional control which may, for operational purposes, control a number of batteries belonging to different Abteilungen (battalions) or even different regiments. The interval between the receipt of the warning and the appearance of hostile airplanes varies considerably, but is always at least half an hour and often much more. The guns also receive 30-minute notices of cease-fire periods during which night fighters would be operating. Warnings of this nature come by telephone from the Untergruppe, which receive them by direct line from the night-fighter control.

In the field a battery operates very often independently, the battery commander being solely responsible for effective employment of his guns. During operations the battery commander himself usually takes charge of the Befehlsstelle.

If gun crews are standing by, it is said that the 88-mm gun can be put into action within 3 to 10 seconds. An average gun crew can feed the guns at a rate of 10 rounds per minute; a very efficient crew can reach 15 rounds per minute.

The maximum effective height for the 88-mm gun is stated to be 22,000 to 26,000 feet, although the extreme height is 33,000 feet.

The extreme angle of elevation is said to be 85 degrees, but in practice the angle of elevation is limited to 60 degrees.

ARMORED FORCE

5. GERMAN HEAVY TANK

As reported in the press and as previously indicated in Tactical and Technical Trends (No. 18, p. 6) a German heavy tank has been in action in Tunisia. So far as can be definitely determined, this is the first time the Germans have used a heavy tank in combat. Whether or not it is the Pz.Kw. 6 cannot be definitely stated. At least one heavy tank has been captured, and while complete details are not yet available, there is sufficient reasonably confirmed data to warrant at least a partial tentative description at this time.

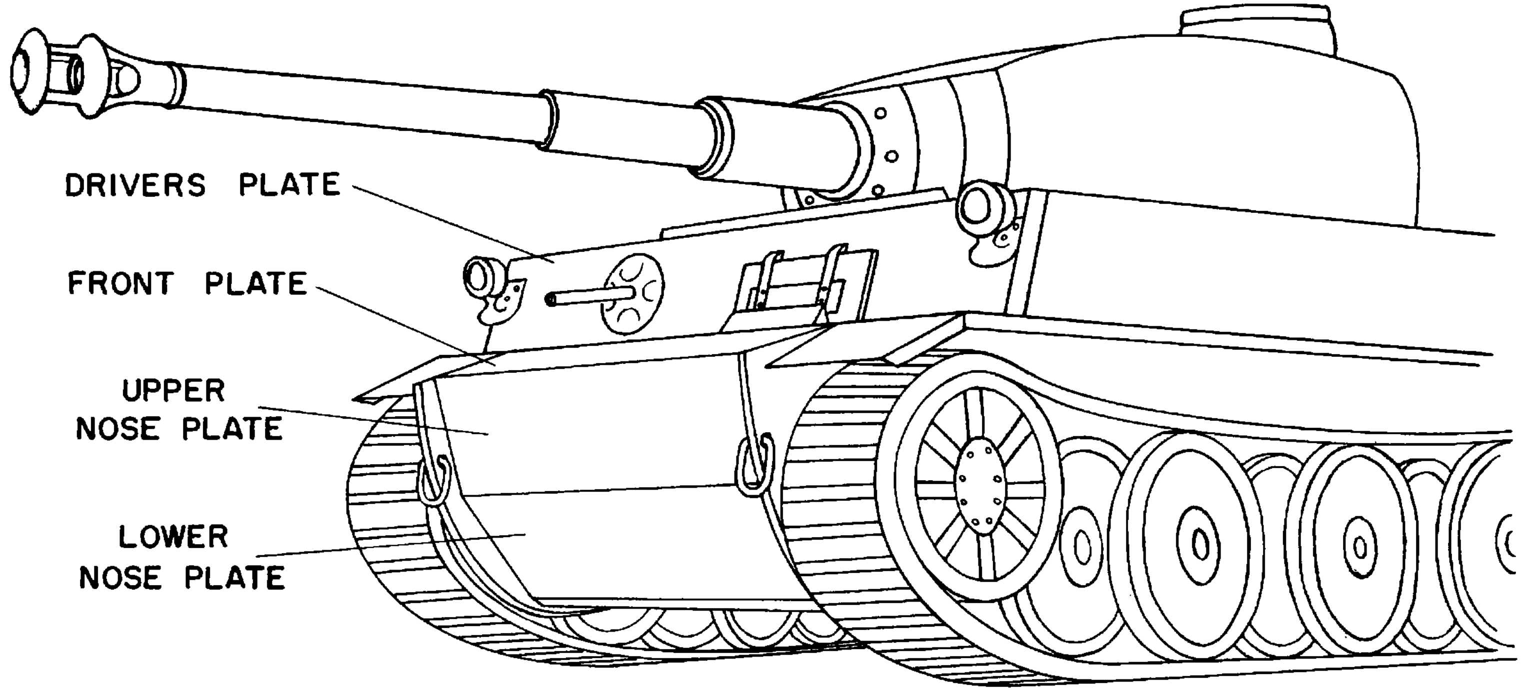
The chief features of this tank are the 88-mm gun, 4-inch frontal armor, heavy weight, and lack of spaced armor. The accompanying sketch roughly indicates the appearance of the tank, but should not be accepted as wholly accurate.

The tank has a crew of 5. It is about 20 feet long, 12 feet wide, and 9 1/2 feet high. The gun overhangs the nose by almost 7 feet. It is reported that the weight is 56 tons or, with modifications, as much as 62 tons.

The power unit is a single 12-cylinder engine. A speed of at least 20 mph can be achieved. Two types of track are thought to exist: an operational track 2 feet 4.5 inches wide, and a loading track which is just under 2 feet. The suspension system consists of a front driving sprocket, a small rear idler, and 24 Christie-type wheels on each side giving it an appearance similar to the familiar German half-track suspension system. There are 8 axles.

There is no armor skirting for protection of the suspension. The armor plating is as follows:

Lower nose plate	62 mm (2.4 in), 60° inwards
Upper nose plate.	102 mm (4 in), 20° inwards
Front plate	62 mm (2.4 in),80° outwards
Driver plate.	102 mm (4 in), 10° outwards
Turret sides and rear	82 mm (3.2 in), vertical
Lower sides (behind bogies) . .	62 mm (2.4 in),vertical
Upper sides	82 mm (3.2 in), vertical
Rear.	82 mm (3.2 in), 20° inwards
Floor.	26 mm (1 in)
Top.	26 mm (1 in)



GERMAN HEAVY TANK

The turret front and mantlet range in thickness between a minimum of 97 mm (3.8 in) to a (possible) maximum of 200 mm (7.9 in). It appears that the armor is not face-hardened.

The armament of the tank consists of an 88-mm gun and two 7.92-mm (.315-in) machine guns. The 88-mm has a double-baffle muzzle brake and fires the same fixed ammunition as the usual 88-mm AA/AT gun. As already indicated, the gun overhangs the nose of the tank by almost 7 feet. The turret rotates through 360 degrees and is probably power-operated. Three smoke-generator dischargers are located on each side of the turret.

Comment: From the above characteristics, it is apparent that the Pz. Kw. 6 is designed to be larger and more powerful than the Pz.Kw. 4. As far as known, a Pz.Kw. 5 tank has not been used in combat. The noteworthy differences between the Pz.Kw. 4 and Pz.Kw. 6 are as follows:

Armor	Pz. Kw. 4	Pz.Kw. 6
Minimum	20 mm	26 mm
Maximum	50 to 80 mm*	102 mm**
Principal Armament	75-mm (long-barrelled gun)	88-mm (AA/AT gun)

A 360-degree rotating turret is used in both the Pz.Kw. 6 and Pz.Kw. 4.

The appearance of the Pz.Kw. 6 indicates that the Germans continue to see the need for a fully armored vehicle equipped with a weapon capable of dealing with hostile tanks as well as with other targets that might hold up the advance of attacking elements.

This tank is undoubtedly an effective weapon, but not necessarily formidable. In the first place, a vehicle weighing from 56 to 62 tons presents many difficult logistical problems. Also, it is reported that one heavy tank was destroyed by a British six-pounder (57-mm) antitank gun at a range of about 500 yards; out of 20 rounds fired, 5 penetrated the tank, 1 piercing the side of the turret and coming out the other side, and another penetrating an upper side plate at an angle of impact of about 15 degrees.

*Attained by attaching extra armor plate to protect critical points on the tank.

**Basic armor plate. The turret front and mantlet may possibly be 200 mm thick.

6. NEW ARMAMENT OF GERMAN PZ.KW. 3 AND 4

As previously reported in Tactical and Technical Trends (No. 4, p. 15) recent models of two German tanks, the Pz.Kw. 3 and 4, have been fitted with more powerful armament, as shown in the accompanying sketches. These sketches are based on photographs of German tanks captured by the British in North Africa.

a. Pz.Kw. 3

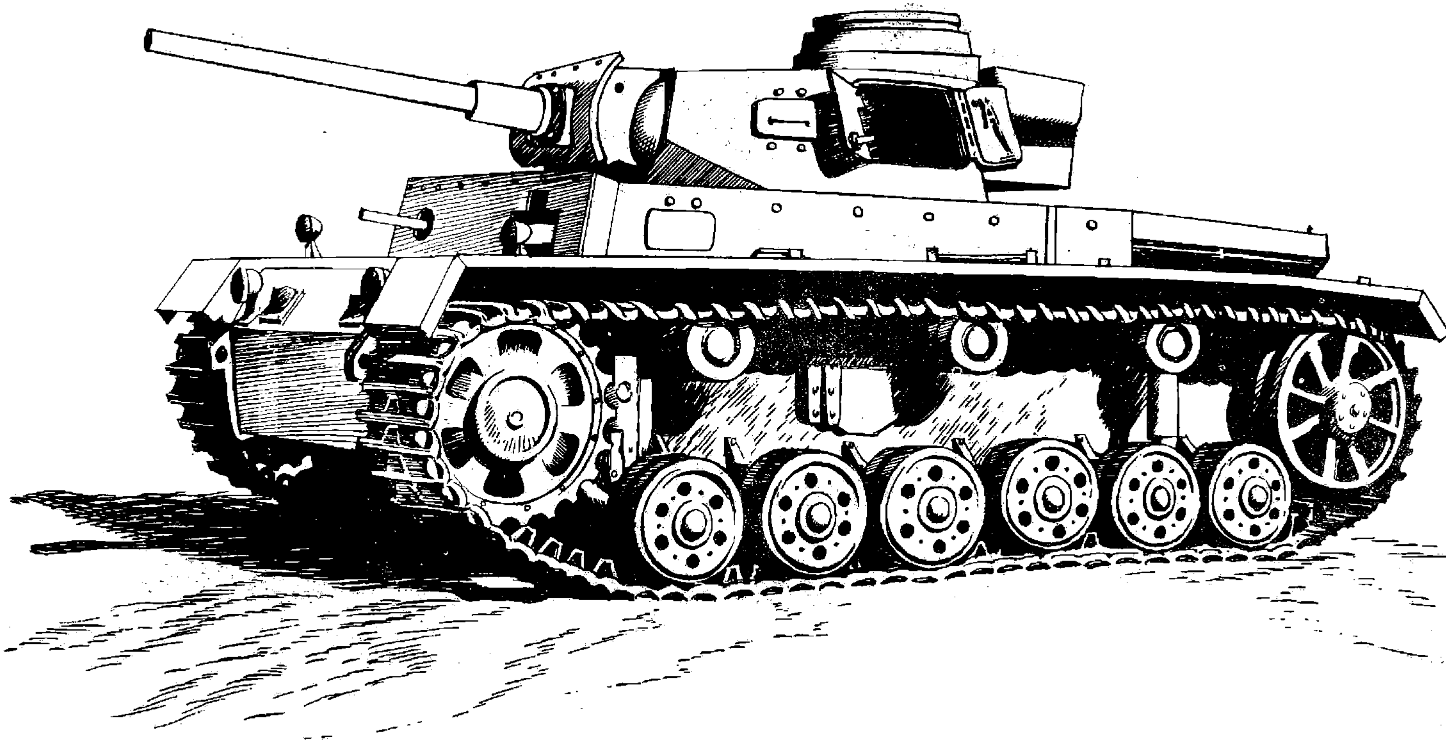
The principal armament of this tank is a long-barrelled 50-mm gun. It is reported that this gun bears considerable similarity to the 5-cm Pak 38 (50-mm antitank gun), except that there is no muzzle brake and that the mounting is, of course, different. The over-all length from the breech opening to the muzzle is 9 feet, 4 inches. The barrel overhangs the front of the tank by about 3 feet. The ammunition used is that of the 50-mm antitank gun with no adaptation or alteration apart from the fitting of an electric primer, the tank gun being electrically fired. The muzzle velocity of this tank gun has been estimated as a little over 3,000 feet per second. It has been reported that the performance of the tank gun should not be very different from that of the antitank gun, the estimated penetration figures for which are as follows:

79-mm (3.1 in) homogeneous armor at 300 yds at 30°
71-mm (2.8 in) homogeneous armor at 600 yds at 30°
63-mm (2.5 in) homogeneous armor at 850 yds at 30°

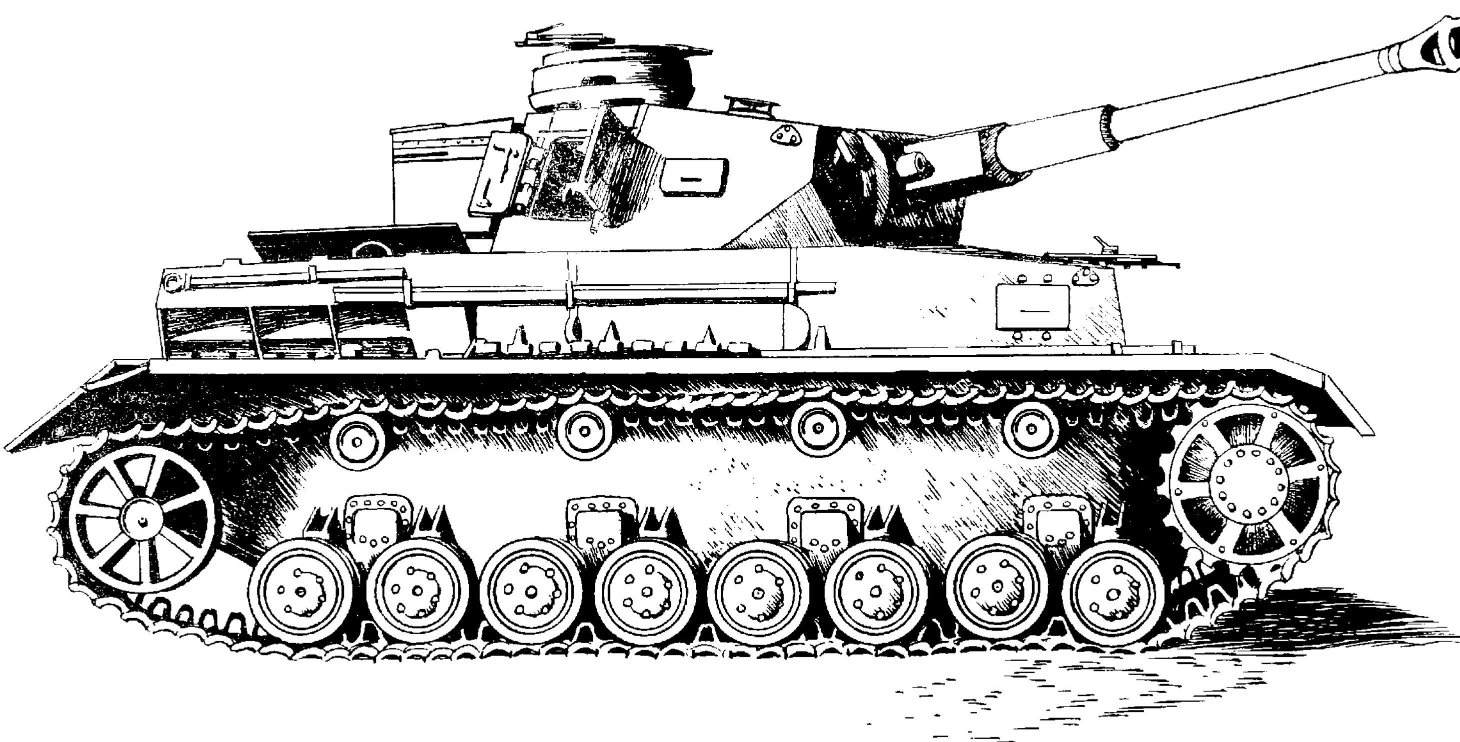
b. Pz.Kw. 4

The principal armament of this tank is a long-barrelled 75-mm gun, the 7.5-cm Kraftwagenkanone 40 (7.5-cm Kw.K. 40). It is reported that the muzzle velocity is 2,400 feet per second (also reported at 2,620 feet per second), and that 2.44 inches of armor plate can be penetrated at 2,000 yards at an angle of impact of 30 degrees. The long barrel, terminating in a muzzle brake, extends beyond the nose of the tank, and an equilibrator was provided, in the particular tank examined, to balance the consequent muzzle preponderance. The equilibrator is fixed to the floor of the turret and extends vertically to an attachment near the rear of the piece; it is 6 inches in diameter and 21 1/2 inches long. The gun is also provided with a traveling lock inside the turret. The traveling lock consisted of two steel bars about 1/2 inch by 2 inches and 15 inches in length. There were hardened semihemispherical surfaces about 1 1/2 inches in diameter projecting from each end of the steel bars, and these fitted into corresponding indentations on either side of lugs attached to the gun and to the turret roof. The steel bars were connected by two bolts; tightening the bolts provided a very positive lock.

Three types of ammunition were found with this tank: nose-fuzed HE; hollow-charge HE; and armor-piercing HE, this being an armor-piercing shell with a ballistic nose and an HE charge.



Pz. Kw. 3



Pz. Kw. 4

CHEMICAL WARFARE

7. GERMAN TEAR-GAS GRENADE

An egg-shaped German grenade captured in the Middle East had a yellow band on the body and four pear-shaped projections on the lower half of the body. It contained a bursting charge and a small metal capsule of CN (chloracetophenone, a tear gas), and was fitted with a standard pull igniter.

8. GERMAN EXPERIMENTS WITH SMOKE AGAINST TANKS

A German document gives details regarding a series of experiments designed to test the use of what is believed to be irritant smoke at close quarters against tanks. It should be remembered that an irritant smoke is a harassing, rather than a lethal, agent. When inhaled, irritant smoke agents cause sneezing, intense irritation of the nose, headache, nervous depression, and nausea.

a. First Experiment

(1) Conditions

The tank was stationary, with hatches closed and engine running. One smoke hand grenade was set off in the immediate neighborhood of the tank.

(2) Results

A high concentration of smoke was built up in the tank, both by suction of the engine fans and by penetration through leaks in the forward entrance hatch, the mantlet of the hull machine gun, the turret ring, and the turret ventilators. Opening the hatches was not sufficient to ventilate the tank.

(3) Conclusions

Under the conditions set forth above, the crew would be forced to evacuate the tank after a short period. The driver and hull machine-gunner* would have suffered most from the effects of the smoke.

b. Second Experiment

(1) Conditions

As in the first experiment, but with the engine not running.

(2) Results

Similar to those of the first experiment.

* Probably because they are nearer the ground, where the concentration of the smoke cloud is greatest.

(3) Conclusions

Evacuation would have become necessary only after several minutes, and then probably only for the driver.*

c. Third Experiment

(1) Conditions

Tank moving; hatches closed. Smoke grenades were thrown at the tank but did not lodge on it.

(2) Results

There was little reduction in the fighting capacity of the crew, who were affected more by limitation of vision than by actual penetration of the smoke into the tank.

d. Fourth Experiment

(1) Conditions

Tank moving, hatches closed. Two smoke hand grenades, one tied to each end of a 6 1/2-foot cable, were thrown across the barrel of the gun.

(2) Results

Evacuation of the tank was inevitable within 30 seconds. All possibilities of observation were eliminated.

(3) Conclusions

If the crew show sufficient presence of mind to put on their gas-masks and rotate the turret through 180°, it is possible to avoid the effects sufficiently to enable the tank to be brought to safety. In any case, however, the fighting capacity of the crew would be greatly diminished.

Comment: There is insufficient detail to identify the type of tank upon which these trials were carried out, but the experiments do show, as the document points out, that smoke can become an important weapon in combatting tanks.

The type of grenade used is not indicated. Much of the effect produced within the tank is described as being physiological (choking and vomiting which

* Here, the suction of the engine fan is lacking, and the vision ports of the driver would provide the principal leakage points.

is characteristic of irritant smokes) and therefore also depends on the speed with which the crews adjust their gas-masks.

The German document states that this method of engaging tanks will be practiced, and preparations made for its use in battle.

ENGINEERS

9. GERMAN ANTITANK MINE--L Pz

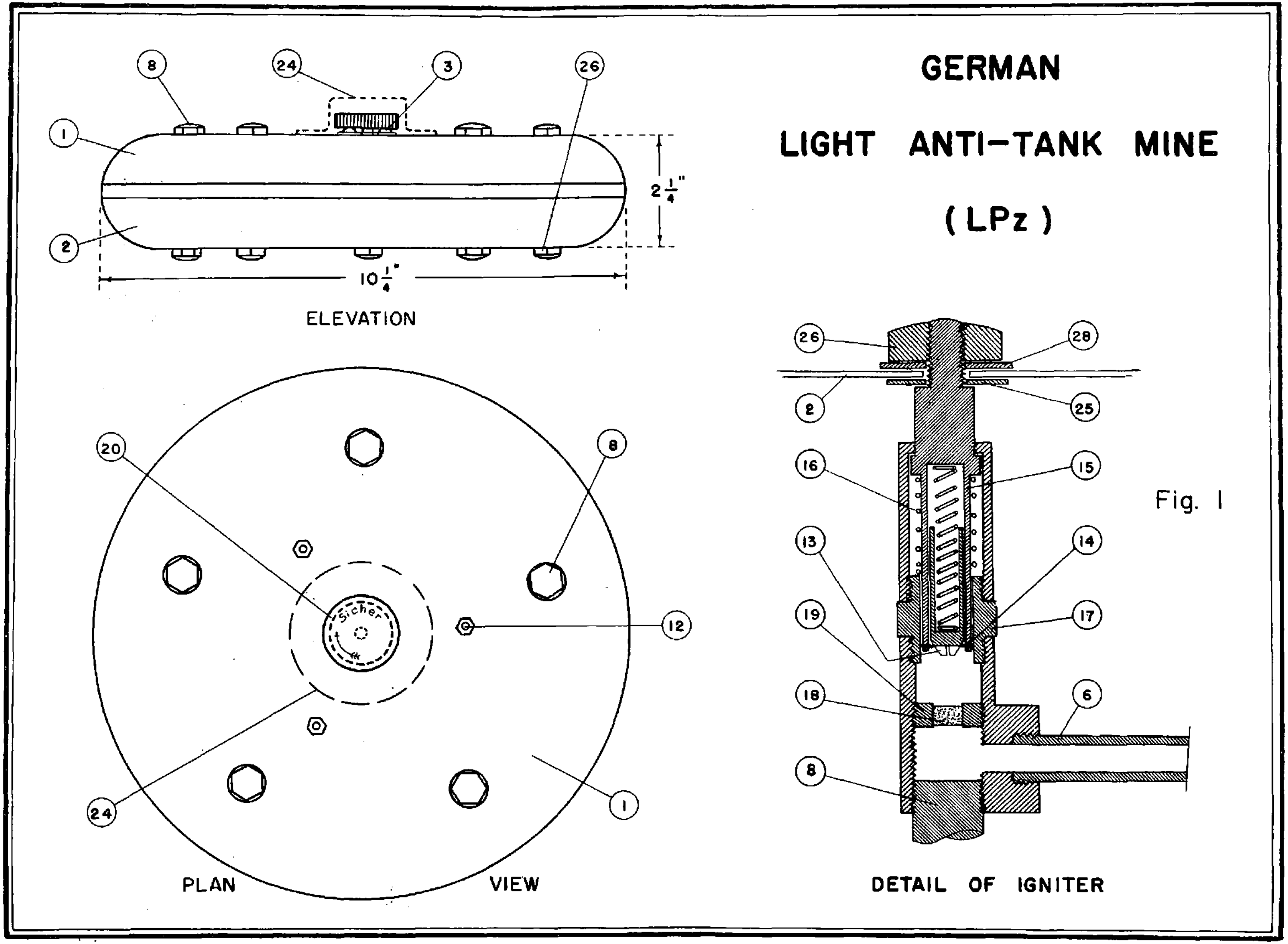
This mine, which was first reported as being carried by German paratroops in their attack at Suda Bay, Crete, was taken from an enemy position in the El Alamein line. It reveals certain details hitherto not observed in German mines recovered in various Middle East campaigns.

The mine body is circular in shape and the specimen examined was painted gray. It is 10-1/4 inches in diameter and 2-1/4 inches deep. The loaded mine weighs about 9 pounds and contains about 5 pounds of TNT. It is noteworthy that the mine examined was stamped 1942.

The mine consists of a pressed-steel outer casing which is in two halves (see accompanying sketch), the upper half (1) being lipped to fit tightly over the lower half (2). The joint is made waterproof with adhesive tape after the mine has been assembled. Attached to the underside of the upper half casing (1) by means of five screws (3) is the flash chamber casing (4) with the detonator retaining collar (5). Five hollow brass tubes (6) connect this chamber with the percussion caps of five light pressure igniters (7) which are equally spaced radially and are secured to the upper half casing (1) by the hexagonal-headed screws (8). The explosive filling is contained in a sheet metal container (9) which is completely watertight. Five holes (10) accomodate the five igniters which protrude through the filling, and three more holes (11) accommodate the three bolts (12) which secure the container to the top half casing (1). Each bolt is secured with a nut (27).

When the pressure igniter (7) is armed, the spring-loaded striker (13) is held, in the position shown in Figure 1 (note that the igniter is here shown in an upside-down position), by two small pins (14) which are housed in slots in the lower portion of the plunger (15). Depression of this plunger against the action of the spring (16) causes the slots to move clear of the sleeve (17). The pins (14) are then free to be forced outward under the pressure of the tapered surfaces at the tip of the striker, thus releasing the spring-loaded striker (13), which fires the percussion cap (18) in the holder (19). The detonator (23) is the standard German detonator employed in the Tellermine and is very sensitive.

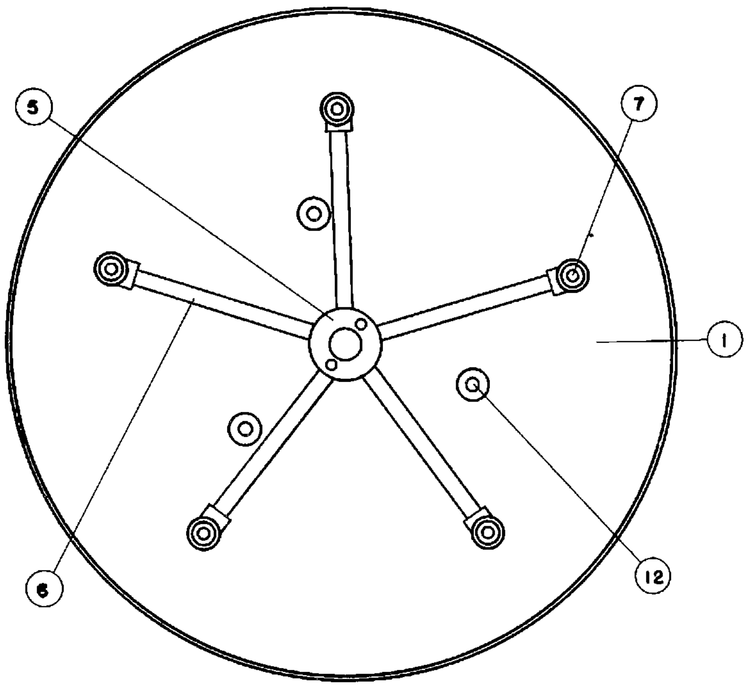
A milled nut (20), attached to a screw-threaded spindle (21), enables



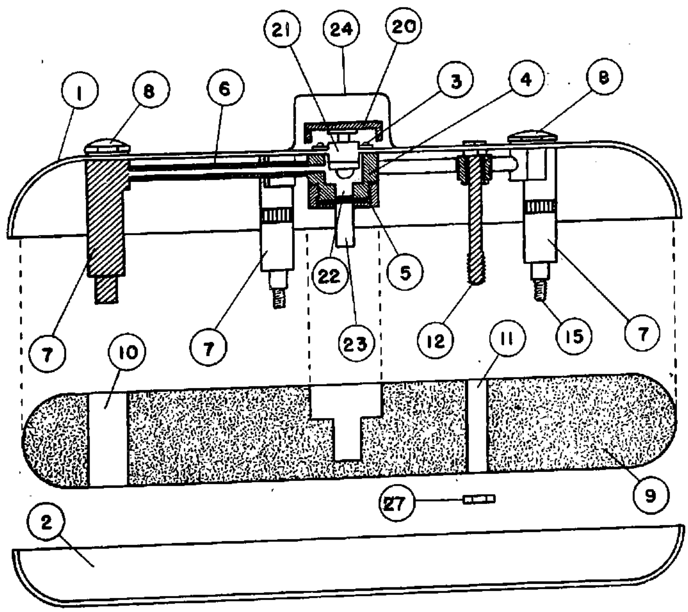
GERMAN
LIGHT ANTI-TANK MINE
(LPz)
ELEVATION
2 1/4"
10 1/4"
PLAN VIEW
Sicher
DETAIL OF IGNITER
1
2
3
6
8
12
13
14
15
16
17
18
19
20
24
25
26
28

Fig. I

GERMAN LIGHT ANTI-TANK MINE (LPz)



VIEW OF UNDERSIDE OF MINE TOP



the flash channel (22) connecting the flash chamber (4) with the detonator (23) to be closed, thus preventing the passage of flashes from the flash tubes (6). A circumferential arrow with the word "Sicher" (safe), stamped on the top surface of the milled nut (20), indicates that the nut should be turned in a clockwise direction to neutralize the mine. The flash channel (22) is actually masked when the milled nut is screwed up tightly and when a white setting mark on the nut is in alignment with a white mark on the top of the casing. A protective cover (24) is attached by means of two studs and a bayonet fitting.

The lower half casing (2) fits over the screw-threaded portions of the plungers (15), with small felt washers (25) on the inner side of the half casing to make the joint watertight. The five hexagonal nuts (26), which are fitted with steel washers (28), secure the plungers (15) to the lower half casing (2).

In order to cause the mine to function when the five nuts (26) are in place, it is necessary for the mine casing to be crushed. This would require a heavy load, so the mine is thought to be intended for antitank purposes--hence the abbreviated designation "L Pz" denoting a light antitank mine. If, however, the five nuts (26) are removed and the mine placed on a hard, even surface, the pressure required to fire the mine is merely that required to overcome any one of the five igniter springs (16). In this condition the mine is exceedingly sensitive, and great care must be exercised when recovering these mines in case such an antipersonnel setting has been employed. The firing of only one of the five igniters is sufficient to detonate the mine.

To disarm the mine the following steps are taken:

(1) Carefully raise the mine clear of the ground, taking care NOT to tilt the mine. Such tilting might cause one of the igniters to go off by pressure against the ground.

(2) Stand the mine on edge and remove the five screws (8) over the percussion caps (18).

(3) Remove percussion caps (18) by unscrewing them in their holders (19).

(4) Lay the mine upside down and, if they are still in position, remove the five nuts (26) together with their washers.

(5) Remove the adhesive tape from the joint of the top and bottom half casings, and force off the bottom half casing by inserting a screw-driver or similar instrument in the joint and levering.

(6) Remove the five felt washers (25) from the plungers (15) and the three nuts from the bolts (12).

(7) Lift off the high explosive container (9) complete.

(8) Unscrew the detonator retaining collar (5) and remove the detonator (23).

INFANTRY

10. GERMAN TACTICS IN NORTH AFRICA

A knowledge of German tactics and methods may serve the dual purpose of turning the lessons to good account both against the Germans and against the Japanese. It is already apparent that the latter have studied and applied German methods of warfare.

In the German offensive operations in North Africa which began on May 26, 1942, the main feature of the German tactical methods, as reported from British sources, were:

(1) Employment of practically the whole of the German forces on the same axis of attack and on a comparatively narrow front, followed by the Italian armored and mobile forces. Italian infantry divisions supported by a small number of tanks were used for diversionary operations. The principle of concentration of force at the decisive point was, as usual, given primary importance, and must always be expected of German commanders.

(2) A night approach march followed by a very rapid advance and direct attack by tanks, after short reconnaissance and preparation against any opposition encountered on the axis of advance.

(3) Forward deployment and offensive employment of all guns of all types, including 88-mm guns, in support of tank attacks and against British counterattacks. Reliable observers report that practically every vehicle, even staff cars, in the enemy's leading columns was towing a gun or a trailer. A senior British commander reports that the German column with which he spent 8 to 9 hours before escaping consisted of:

8 armored cars
6 tanks
two platoons of motorized infantry
4 105-mm guns
4 88-mm guns
12 50-mm antitank guns
12 37-mm antitank guns
4 assorted self-propelled guns.
All vehicles towed guns or trailers.

(4) The enemy was quick to cover his front with antitank guns when tanks were brought to a standstill or stopped to refuel, and to protect his flanks at all times with an antitank screen. A threat to the enemy's flanks by British tanks was immediately met by the deployment of antitank artillery, while the enemy tanks continued their movement. It was useless to expect that British tanks would not encounter strong antitank defense in any offensive movement. The enemy appeared to have a rapid "follow the leader" deployment drill, and a system of visual control by means of colored disk signals.

(5) The efficiency of the enemy's recovery, repair, and maintenance generally was evidenced by the speedy renewal of his offensive after his first effort had failed to achieve his object, and the maintenance of the offensive for so long and over such great distances. The tactical advantages derived from a highly efficient system of recovery, repair, and maintenance are obvious.

(6) Enemy control was quick and personal. When an objective had been captured, the next move followed without delay, and it was usually action by the whole available force, not by reconnaissance elements or detachments only. This was evidenced in the advance east after the capture of Bir Hacheim, and again after the capture of Tobruk.

(7) Defensive positions were reduced by concentrating against them in turn. This is obviously the way to deal with positions that are out of supporting distance of each other when the complementary armored formations, for which the defensive positions serve as pivots, have themselves been forced on the defensive. This is another example of the firm application of the principle of concentration.

(8) Every effort was invariably made to draw the fire of the defense, especially the fire of antitank weapons, by the deployment and advance of some tanks. The tanks which had advanced were then withdrawn, and the enemy concentrated his artillery and mortars on all the defenders' weapons that disclosed themselves. After a thorough preparation of this kind, the real tank attack was launched.

(9) A case has been reported of mine-lifting being carried out in the following way: detachments of tanks advanced to the edge of the minefield and engaged all of the defending weapons they could see. Engineers then debouched from the tanks and proceeded to clear mines on foot, covered by the fire of the tanks. Tanks that were hit were pulled out by other tanks and then replaced, or the whole detachment withdrew and renewed its activities at another point. (Offensive use of small arms is the obvious answer.)

(10) Officers who have been in enemy hands, and enemy prisoners, report that ground-strafing aircraft were always engaged with intensive fire from every available small-arms weapon, including rifles. No one who was armed "went to ground" on such occasions.

11. NOTES ON SOME GERMAN TACTICS USED IN RUSSIA

Reports from an Allied Mission attached to the Russian Army highlights some tactical maneuvers used by the Germans in the Russian operations. Some of these tactics are mentioned under the following headings:

a. General Characteristics

The close cooperation of all arms was brought into play--all arms being subordinated to the success of mass tank formations. Great stress was laid on speed and surprise. Though detailed orders were issued, full scope was allowed to local commanders for their execution.

b. Surprise

Surprise was achieved by secrecy, rumors, and false orders. Tanks were moved about (especially by rail) in an area where the main blow was not to take place, and at the same time, the main striking force was kept concealed elsewhere. Immobile dummy tanks were also used.

c. Psychological Methods

At the moment of a tank attack, paratroops armed with automatic weapons were dropped. Troops which had gotten to the rear of the Russian defenses fired indiscriminately in an attempt to break the defenders' morale. Parachutists or motorcyclists were used for the seizure of nerve centers.

d. Frontal Attacks

Frontal attacks were always avoided by the Germans. German tanks reacted quickly to antitank fire; where a strong antitank defense was met the attack at that point would be called off. The Germans then would appear to be getting ready for a second attack in the same place, but would in fact be searching the front for spots that were weak in antitank defense.

e. Advance

While the leading detachments proceeded forward, the German main body would follow in march column. When resistance is encountered, the leading detachments deploy on a wide front, and strong reconnaissance detachments are sent out to the flanks; the main body remains in march column.

f. Attack

The arrowhead formation was the normal form of attack used. The order of march was as follows:

(1) Motorcyclists, with assault weapons in the lead;
(2) Tank regiment, with two battalions forward if frontage is 1 to 2 miles;

(3) Armored infantry, deeply echeloned.

The remaining infantry either advanced far to one flank or remained concentrated in the center ready to widen any gap that presented itself.

g. Defense

The defense was very elastic. Towards dusk, detachments of armored infantry would move forward in front of the main line of resistance to give the impression that the edge of the defensive zone was further forward than it actually was. The remainder prepared the main battle position. Some tanks were dug in on the defensive position. When the defensive preparations were completed, a majority of the tanks withdrew to assembly points in the rear. A few single Pz.Kw. 3's and 4's remained dug in on the position as pivots of fire.

There follow Russian answers to questions concerning the tactics and operation of German armor in the Russian campaign.

(1) Where do the various German Headquarters march in a full-scale tank attack?

During battle, the Headquarters of a tank force is placed as near as possible to the forward units, in order to obtain observation over the field of battle. Protection of communications with flank and rear units from fire is one of the considerations affecting the location of the command post.

(2) What is known about protection of tanks on the march and in final assembly positions?

Assembly positions and routes of advance are usually protected by three tiers of fighter planes flying at heights of from 18,000 to 20,000 feet, the most intensive patrolling being at 6,000 to 7,500 feet.

(3) Describe aircraft support during a tank breakthrough.

The tank attack is preceded by attacks by bomber aircraft (Ju-87, Ju-88, less frequently He-111) and by fighters (Me-110), in groups of from 20 to 30 planes endeavoring to pave the way for the tanks. The Me-110's operate in front of the bombers, attacking enemy troops with their cannon and machine guns.

When organizing cooperation between aircraft and tanks, the German command pays a great deal of attention to communications and control. Therefore, an air force control post is established with each Armored Division. These posts are commanded by experienced air force officers, who ride in the tank unit commander's tank at the head of the column. In contact by radio with the air force control post, he directs the aircraft to the targets as required.

(4) How are fuel and ammunition supplied to tank units which have broken through to the rear of the enemy?

The German command employs transport aircraft (preferably Ju-52) to supply such tank units as have broken through into the rear of the enemy defenses with ammunition and fuel. The Germans have a considerable number of transport aircraft and provide substantial help to small groups of tanks. But the basic problem of supplying tank units with fuel and ammunition devolves upon line-of-communications organizations.

In so far as the cooperation of the German air force with tanks is concerned, there is a marked tendency on the part of the German command to employ their air force with great mobility. In the course of operations in the south of Russia, it was noticed that the German air force units were rapidly moved from one sector of the front to another, as operations required.

MEDICAL

12. PREVENTION OF MALARIA*

a. General

Malaria is caused by a small blood parasite and is spread only by the bite of the female Anopheles mosquito. The disease is widely distributed over all parts of the tropical and subtropical world and is also found in many of the more temperate regions (see map at back of book). In times past, American troops have been faced with the problem of malaria not only in the southern United States, but also on posts of duty in Panama, Puerto Rico, Haiti, Nicaragua, and the Philippine Islands. World War II has carried United States forces to many new and different countries where malaria is present to an even greater degree. The disease is of tremendous tactical and medical importance in all the major theaters of operations, including the Southwest and South Pacific, India, and the Near and Middle East. Malaria will become increasingly important in North Africa following the rainy season, and the disease is ever present in Central Africa and in Central and South America. From the standpoint of prevalence and of the disability produced, malaria is the most important of all diseases in the world today.

Malaria mosquitoes breed under a variety of conditions. The most suitable locations are in slow-moving streams, swamps, lagoons, and marshes

*Prepared in the Medical Intelligence Branch, Prevention Medicine Division, Office of the Surgeon General.

where water is either fresh or brackish (though some species have adapted themselves to breeding in salt water). Other potent carriers of malaria breed in small pools of still water, and in collections of rain water in hollows and depressions in the ground, such as borrow pits and hoofprints. Engineers frequently, though unintentionally, contribute to the breeding of mosquitoes and the spread of malaria by creating artificial breeding places during construction work. In dry, arid areas, anopheline mosquitoes have adapted themselves to desert conditions and are able to breed in mere trickles of water. They may also be found in large numbers about oases, irrigation canals, shallow wells, and ditches. Several varieties of malaria-carrying mosquitoes breed in small collections of water about houses, and, unless care is taken, may enter buildings through carelessly opened screen doors, torn screens, cracks, and the junctions of corrugated or tiled roofs with walls. While malaria and malaria mosquitoes are encountered most often in the lowlands, they may appear at altitudes up to 6,000 or 8,000 feet, as in Ethiopia and Iran, and in certain parts of India and China.

Anopheline mosquitoes usually feed between dusk and dawn but will remain in darkened hiding places during the day. Anophelines do not like wind and often seek the protection of dark rooms, outbuildings, and underbrush. They rarely fly more than 1 to 2 miles from breeding places. Small collections of water, or sluggish streams having a border growth of grass or rushes, are preferred by many species of anophelines for depositing eggs.

Man is the reservoir of the malaria parasite. Anopheline mosquitoes become infected when they feed on a human who has the disease. After the parasite has developed within the mosquito for a period of from 14 to 40 days these mosquitoes are capable of transmitting the infection. In heavily malarious areas as much as 80 percent of the population may be infected with the disease.

b. Preventive Measures

(1) Sleep in screened rooms or under mosquito nets. Inspect screens, doors, and mosquito nets at regular intervals, and search for live mosquitoes in those parts of the house where there is little light. Permanent buildings should be thoroughly screened. Screen doors should always open outward.

Entrance vestibules with a screened door at each end (mosquito lock) will prove invaluable in excluding mosquitoes from buildings.

(2) After dark, stay indoors in properly screened buildings as much as possible.

(3) When it is necessary to be out of doors after dark, move about continually. When advisable, use head nets, gloves, and leggings along with other mosquito-proof clothing covering the entire body. Mosquitoes are able to bite through the material ordinarily used in shirts and other lightweight

clothing.

(4) Mosquito repellents should be applied to all exposed parts of the body at regular intervals. There are three good repellents (612, indalone, and dimethylphthalate) which are being issued by the Quartermaster. Of these, 612 will give good protection against mosquitoes for about 4 hours after liberal application, even under sweating conditions. Indalone will do about as well, except under sweating conditions, when it should be renewed half-hourly. Dimethylphthalate is slightly less effective than 612, but more effective than indalone. All are better than any repellents available heretofore.

(5) Insect sprays should be used inside airplanes and living quarters in the early morning and late afternoon, and at other times when necessary. The newly developed Freon pyrethrum aerosol insecticide spray is recommended.

(6) If possible, camps should be located on high, windswept ground, away from areas infested with mosquitoes and far removed from native villages (the inhabitants of which are usually infected and act as reservoirs of malaria). In permanent camps, control measures should include clearing, draining, and filling of low ground where possible, and all potential breeding places should be oiled or sprayed with Paris green as indicated (see S.G.O. Circular Letter 22, January 16, 1943).

(7) The use of quinine or atabrine for prophylaxis is not recommended as a routine procedure, since the available information indicates that these drugs do not prevent infection. They are, however, of definite military value in that they do prevent clinical symptoms of malaria so long as they are taken, and thus afford a means of keeping troops fit during periods of emergency in the field. Such drugs should be used only under special conditions and when advised by medical officers, flight surgeons, or local health authorities. The present War Department policy advocates atabrine 0.1 gram (one tablet or one and one-half grains) twice daily after meals on 2 days a week, allowing a 2- or 3-day interval between the days of taking. Under exceptional circumstances the dosage may be increased to two tablets on 3 days a week, still allowing an interval between days of taking. If atabrine is not available, take quinine sulfate 0.64 gram (2 tablets or 10 grains) after the evening meal each day (see S.G.O. Circular Letter 135, dated October 21, 1942).

(8) The estivo-autumnal, or malignant type of malaria, may give rise to unusual symptoms entirely different from the usual chills and fever. It is therefore advisable, when residing in, or travelling from, malarious areas, to suspect malaria when the cause of illness is unknown, regardless of whether there is fever or not. A physician should be consulted and advised of the recent possibility of exposure.

Comment: In the article in the previous issue - "Dangers" of the Tropics - reference was made to the problem of malaria, in a way that tended

to "play down" the dangers from malaria, and also was written to apply to peacetime conditions.

The present report deals with the subject from the point of view of military medicine and, as such, should be considered as reflecting current Army medical opinion on this matter.

ORDNANCE

13. NEW GERMAN 70-KILOGRAM BOMB

It is reported that the Germans have developed a 70-kilogram (155-pound) HE bomb with a medium-thick casing. This bomb is intended to replace the SC* and SD**50-kilogram (110-pound) general-purpose HE bombs. The wall-thickness of the new bomb is 10 mm (about 0.3 in), and the filling 21 kilograms (46 pounds) of TNT. The blast effect is reportedly as great as that of the SC 50-kilogram, and the fragmentation greater than that of the SD 50-kilogram. The fin assembly and external dimensions of the 70-kilogram being the same as the SC 50-kilogram, the same bomb rack can be used.

14. MARKING OF GERMAN HE BOMBS

From German sources it is revealed that the distinguishing color given to this particular type of ammunition serves to identify its category and characteristics. The following document (translation) is reproduced as of interest in this connection.

* * *

Technical Sheets Issued by the Quartermaster General (Air equipment)

Berlin, 29th August, 1941

Subject:--Distinguishing colors of HE bombs.

HE bombs are divided into various groups according to their effect, regardless of their caliber. Each group has a distinguishing color to facilitate

*SC is the designation for the bomb with a thin casing, which achieves its effect chiefly by blast.

**SD is the designation for the bomb with a thick casing, which achieves its effect chiefly by fragmentation. The SD has greater penetrating power than the SC, and was designed for attack on modern reinforced concrete structures.

handling and avoid confusion. This measure can only fulfill its purpose if the distinguishing colors are known to the units.

As it has been found that these colors are frequently not known, the meaning of the various colors is given below:

(1) Green--all bombs with purely splinter effect (cement splinter bombs);

(2) Yellow--all mine bombs with the distinguishing letters "SC";*

(3) Red --SD2*, SD50, SD250 and SD500, thick-walled HE bombs (splinter and mine effect);

(4) Blue--all bombs with particularly powerful penetration (armor-piercing bombs);

(5) Yellow with blue stripe--SD 1,700 HE bomb with increased penetration.

The bombs referred to under (1) are painted green all over; the other colors are painted in stripes on the conical part of the fin assembly.

15. AXIS MOTOR VEHICLES IN NORTH AFRICA

Representatives of a well-known Canadian motor vehicle manufacturer recently inspected enemy vehicles captured by the British in North Africa. The vehicles examined were German Ford and Opel-Blitz trucks, and Italian Spa trucks, varying from 1 1/2 to 8 tons. While the vehicles in question were not recent models, the following observations by the manufacturing representatives are of interest.

The front and rear springs of the vehicles inspected were heavily built. The leaves were wide, and long. All front springs were equipped with two rebound leaves mounted on top of the spring. The first rebound leaf was three-quarters the length of the main leaf, and the top leaf was half the length of the main leaf. There appeared to be no broken springs on any of these vehicles.

The large diameter of the gasoline-filler neck greatly assists in refueling from small cans in the field. The gasoline tanks were enamel-plated on the inside to prevent rusting. The spare gasoline cans were similar to the American 5-gallon can; except that they were enamel-plated on the inside and that the neck was equipped with an attached, snap-on top instead of the threaded type.

*See footnote to previous article.

Nearly all vehicles were equipped with oil-bath air cleaners. There were two types: one using a single metal-screen cone, and the other a double metal air cone, immersed in cylinder oil. The double unit takes in air over the top, but cleans the air twice through two conical metal screens, one inside the other, with an air space between them. The single unit takes air in from the bottom, and the air is cleaned once through a conical metal screen. The representatives were much impressed with these air cleaners.

Practically all radiators were built of tubular removable sections, and this feature would assist considerably in repairing radiator cores.

16. THE NEW GERMAN MACHINE GUN--M.G. 42

Recently captured specimens reveal that the Germans are using a new machine gun that is superior to their standard M.G. 34 in several respects. The differences from the M.G. 34 are:

(1) The M.G. 42 is designed for faster and cheaper production by an extensive use of stamping and welding in the receiver, barrel casing, feed mechanism, operating handle, and antiaircraft rear sight.

(2) It has an excellent barrel-change arrangement which is much faster than that of the M.G. 34. A simple movement allows a hot barrel to be removed from the gun and a fresh, cool barrel inserted with a reverse movement.

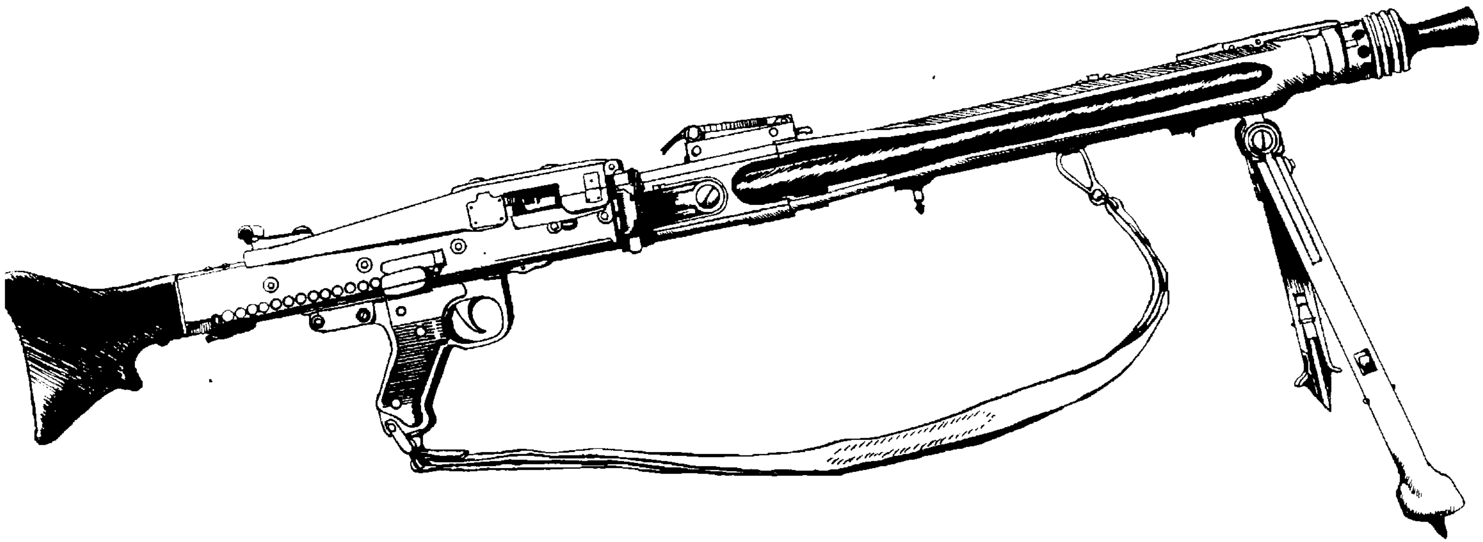
(3) It has an improved method of locking the barrel to the bolt as a round is fired.

(4) There is no provision for semi-automatic fire as in the M.G. 34 with its double trigger (one for full automatic and one for semi-automatic fire).

(5) Cyclic rate of fire has been stepped up to 1,050 rpm in the M.G. 42 as compared to the 900 rpm of the M.G. 34.

The above changes eliminate many of the intricate machine-tool operations needed for the bolt and other parts of the M.G. 34.

The M.G. 42 uses the same ammunition, ammunition belt, and drum or belt box as the M.G. 34. It is generally handled and stripped in the same manner. There is some difference in the method of attaching the bipod and the antiaircraft ring sight. Also, the slots for attaching the gun to a tripod incorporated into the receiver of the M.G. 34 are not present on the receiver of the M.G. 42; it is therefore probable that the M.G. 42 is designed to use a different tripod than does the M.G. 34.



German M.G. 42

QUARTERMASTER

17. NEW LUFTWAFFE OVERALL

It has been reported in the German press that the Luftwaffe has adopted a new uniform overall for high-altitude and cold-weather operations. Its weight is about 9 pounds and it will replace the electrically heated overall weighing 55 pounds, heretofore standard equipment. It is modelled on native Lapland winter clothing. Tests by air squadrons operating from Norway are said to have proven its value in facilitating the wearer's movements and in saving about 220 pounds weight on bombers.

18. GERMAN CONCENTRATED FOOD FOR MILITARY USES

The German technical press reports the large-scale preparation of a standard 30-pound (approximately) so-called dried vegetable "bomb" containing an assortment of compressed dried beans, peas, carrots, cabbage, spinach, onions, and potatoes. These rations are designed to be dropped from airplanes to isolated German units. It also reports special balanced-meal units composed of dried vegetables, meat, fruit, and fats compressed into a single cube prepared particularly for use in long-distance submarines.

GENERAL

19. GERMAN DISCIPLINE

The short article translated below appeared in a Berlin daily newspaper dated April 8, 1942, and is believed to reflect the general attitude of the German civilian and military personnel toward the subject of discipline. This is the first article on this subject noted in the German press subsequent to the early summer of 1941. The controlled German press publishes news and articles written and edited to conform to the German viewpoint, as prescribed by the governing authorities. As can be seen from its text, this article appeals to the German's well-known pride in his discipline. The purpose of its publication was probably to console both the German soldier and civilian for hardships endured and for losses sustained during the severe winter in Russia in 1941-42. It was also intended to assist in maintaining the traditional high standard of discipline during the serious strain confronting the nation in the months to come. For these reasons, though not of recent publication, the article is felt to be pertinent at this time, in view of the present situation on the Russian Front.

* * *

The expression "military discipline" conveys a definite idea, which is inseparably linked with troop training. Discipline characterizes the appearance, behavior, performance, conduct, and value of military units.

An undisciplined company will execute an order haphazardly, or it will even fail to execute it at all. Without discipline, confusion reigns, and when the situation becomes serious under hostile fire, both coolness and cooperation are absent. Then the superior officer is no longer the actual commander.

There is a well-known saying: "Troops are like their commanders." Resolving this statement into the elements of discipline, it means that the commander must be the best-disciplined man in his unit if he demands obedience from each of his subordinates. It is an error to believe that military discipline consists only of obedience to the orders of officers and noncommissioned officers. True, this is ostensibly correct on the drill field or in a maneuver, but not in battle. In actual combat, there must be another kind of discipline, a self-discipline originating within the individual. This is differentiated from formal obedience chiefly by the fact that it prevails without the presence, the command, or the supervision of a superior; in addition, it is maintained under the stress of tense situations.

I recall the case of a sergeant who had been ordered to hold an advanced post under all circumstances. One morning, his post was cut off by the Soviets. His situation was hopeless. Nevertheless, he held his post in spite of heavy losses. He formed an island, an unassailable island, not so much in the tactical as in the moral sense. He held out, not because he knew that his comrades would come to his rescue, but because he possessed self-discipline which to him meant soldierly honor, decency, duty, and comradeship. His self-discipline forced him to stand and, if necessary, to fall at his post. It never entered his thoughts to question

why it must be so. An order had been given, and naturally it would be executed.

The past winter has seen many such "islands" of the highest type of discipline. They have often ended in the sacrifice of life--the fulfillment of the last soldierly duty. They are the monuments to the great struggles occurring in recent months.

Soldierly discipline is not only a matter between superiors and subordinates; it involves outward actions as well as self-indoctrination. In order to stand the test, soldierly discipline requires: a firm foundation; a good military training, not too brief in duration; competent leadership; frequently a firm hand; exertions and privations; tests in courage under dangerous situations; information repeatedly as to what the battle is all about.

Military service demands a will to achieve the highest goal. It is not the individual action which decides, but rather a soldierly will on the part of each individual in the nation to carry out higher orders in a common effort. Therefore, in war, self-discipline is not restricted to the soldier alone. It is a matter that affects political, commercial, and cultural life as well as the life of the community and the family. It is the actual foundation of war, which is the fulfillment and demonstration of collective force. Self-discipline characterizes the individual as well as the entire nation. It is a matter of spirit, conscience, morals, and of the heart. It is the manifestation of a soldierly creed.

* * *

Comment: In general, the German soldier, as well as the German civilian, considers discipline as a matter of honor. This trait in the German people is encouraged, developed, and exploited by their political as well as their military leaders, with a view to uniting all the German people in their war effort. This the leaders have succeeded in doing to a remarkable degree.

The German soldier, as a rule, takes pride in his ability to withstand hardships and privations. He frequently receives commendation from his officers and friends for his performance in this respect, but never effusive sympathy.

Keeping the soldier constantly informed as to why he is fighting, what the battle is about, and his part in it, has been found to pay dividends in improved discipline in combat.

It is believed that there is still a high standard of discipline in the German Army, maintained in spite of the hardships, privations, and losses incident to the present campaign in Russia.

20. PAY OF GERMAN ARMY PERSONNEL IN AFRICA

For purposes of factual information, a report on the conditions and scales of pay in the German Army personnel in Africa is furnished in the following statement, received from German sources.

The pay is made up of four elements:

(1) Wehrsold	Army pay
(2) Frontzulage	Active service allowance
(3) Afrikazulage	Africa allowance
(4) Kriegsbesoldung (or)	War emoluments
Friedensgebuehrnisse	Peace emoluments

a. Army Pay

Army pay is disbursed on the 1st, 11th, and 21st of every month, officers and other ranks getting their pay from the same pay clerk, and through the same channels. The following table gives the scales:

Pay group--rank	Pay in lire every 10 days
16 Pvt	96
15 Pfc	115
14 Cpl	134
13 Lance Sgt	153
12 Sgt	172
11 1st Sgt	191
10 2d Lt	230
9 Lt	258
8 Capt	306

b. Active Service Allowances

Active service allowance amounts to 1 RM (1 Reichsmark = 7.7 lire) per day for each soldier irrespective of rank and is paid out with the Army pay. It must be noted that, although the last period of every month varies from 8 to 11 days, the pay is constant, but the active-service allowance does vary between 61 and 85 lire.

c. Africa Allowances

Africa allowances are reckoned from the date of arrival in Africa, but the money is built up as a credit. When the soldier goes back to Germany on leave or on posting, he takes with him a sort of check which can be cashed at any Pay Office and must be drawn in on payment. The scale is as follows: privates, 2 RM per day; noncommissioned officers, 3 RM; officers, 4 RM.

d. War Emoluments and Peace Emoluments

The difference between these is slight. The former is drawn by noncommissioned officers and officers who in peacetime are civilians; the latter by regular noncommissioned officers and officers of the standing army. In both cases a certain fixed pay is paid in to the banking account of the individual. A lance corporal received between 70 and 90 RM per month, the amount depending on where he lives. He gets more if his home is in a town, because rents are higher than the country.

The soldier in Africa, therefore, amasses quite a large amount of Italian lire. There is not much he can do with them, and little value is attached to them. It is a common thing for high-stake gambling to cause 8,000 lire to change hands without arousing any feeling on either side. For the thriftier, opportunity is given once a month to send money home. It is handed to the Pay Clerk, who gives a stamped receipt to the soldier and remits to the desired banking account in the Fatherland.

Comment: By converting these pay and allowance rates into United States money of current exchange values, we find the total monthly sums received by German Army personnel in Africa, in the grades of private to captain inclusive, are approximately equivalent to:

Pay group--rank	
16 Pvt	$ 51.45
15 Pfc	94.78
14 Cpl	97.78
13 Lance Sgt	100.77
12 Sgt	103.76
11 1st Sgt	106.77
10 2d Lt	125.02
9 Lt	129.44
8 Capt	136.92

The above computation is based on 1 Lire = 5.26 cents and 1 Reichsmark = 40.33 cents, rates of exchange published in U.S. Treasury Dept. Circular No. 1, July 1, 1942.

Attention is called to the fact that the pay of German Army personnel in Africa, as shown in this report, is lower than that of American troops in this theater.

SECTION II

REGULATIONS GOVERNING JAPANESE TROOPS OCCUPYING CONQUERED AREAS

REGULATIONS GOVERNING JAPANESE TROOPS OCCUPYING CONQUERED AREAS

Having consolidated their earlier gains of the war in the Southwest Pacific area, the Japanese began to advance to the south and to the east in the spring of 1942. The push southward has been marked by the Battle of the Coral Sea, the Japanese occupation and loss of Guadalcanal, and the fighting in southeastern New Guinea. Such operations involved not only the capture of the land areas concerned, but also their administration and defense so that they might be available as bases for future operations. Troops were specially detailed to follow the initial attack or advance and take over the administration and defense of the captured areas. They might be referred to as occupation or base troops.

Such elements undoubtedly moved south to the large Japanese advance base at Rabaul, New Britain, in the spring of 1942, as part of a major operation intended to culminate in an attack on Australia. By May 1942 Japanese troops had landed on Tulagi near Guadalcanal, and by the middle of July work had been begun on Henderson Field on Guadalcanal. On July 1, 1942 the Japanese "8th Base Force" was at Rabaul, though elements thereof had already probably moved south. There follows a translation of a Japanese document dealing with the duties of the "Guard Forces," i.e., the troops detailed to the administration and defense of captured areas.

* * *

Eighth Base Force - Regulations No. 3
July 1, 1942 (Rabaul)
Duties of the Guard Forces

a. General Principles

(1) The areas to be defended by these forces include the land, sea, and air in the regions occupied by the Imperial Forces southeast of the equator to New Guinea and to the east thereof.

At the important points within the wide areas which these units will control, bases will be established from which to advance the plans for attacking the east coast of Australia, in conjunction with other friendly forces. These units will also guard the conquered areas, preserve the peace, and protect the sea lanes. A most important duty will be to enforce military rule in conquered areas.

The areas which these units are to defend, and from which advances will be made, is near the focal point of the concentrated strength of U.S., British, and Australian forces. Our units are to perfect the defenses of the important areas and then advance, intercepting the enemy, wrecking his combined operations, and annihilating him. This operation, we believe, is the key to the successful termination of the Greater East Asia War.

(2) All men of these units should consider the above-mentioned duties as being of foremost importance; and they must fight daringly in the front lines of this, the most important battleground beneath the southern stars, overcoming all difficulties and breaking down all barriers, concentrating all efforts and striving always at fever pitch for Japan,--vowing to win this great battle.

However, that enemy sea, land, and air attacks will become vigorous and persistent, is something that we naturally expect from a standpoint of strategy. For this reason, take proper security measures in all defensive patrols and in an emergency be ready to launch immediately a full-scale counterattack. While bearing in mind that defensive measures may have to be taken, always retain the initiative and make it your number-one duty to overpower the enemy. The various units which are assigned to the defense of important points will desperately defend their allotted areas, and will also concentrate their efforts on keeping to a minimum the damage caused by enemy attacks.

(3) Discipline is the core of a military force, and naturally, in times of battle, all duties will be performed in a soldierly manner. The noble ideals of loyalty and patriotism are naturally related to leadership and obedience, and these are the basis for the fighting strength so manifest in the Imperial Forces. This is brought about by harmony and order within the unit itself. The soldier, showing his love for the soul and spirit of Japan, adds luster to his unit, and if this spirit be shown by one who has undergone hardships, then he gives greater glory to the Imperial Forces.

Front-line duty involves many factors which make it different from peacetime duty on board a warship or within a unit. At the present time, in the Imperial Forces, this is evident in stricter discipline and a flourishing martial spirit. The importance of these factors must never be overlooked.

If you think that due to a hasty expedition to foreign parts, or because of special circumstances occuring once in ten thousand times, there is any exception to this rule of strict discipline, you are under a great illusion. All commanders must make this matter their first concern and never relax their vigilance, being always ready to guide their men along the right path.

(4) If these units obey and follow their duty as outlined above, their strategic mission in offensive and defensive actions and in the guarding of the sea lanes will be successfully accomplished. However, in places where no civil government has been established, this force will also, without neglecting its strategical duties, enforce order within the various areas and assist in the civil administration. While one can say that a knowledge of how to govern foreign peoole is not easily come by, the indomitable, peerless Imperial Forces, who never violate a solemn and fearful dicipline, will be able to work together with these people and rule. However, there should be a period in which the subordinate people should be led and trained.

b. General Functions

(1) Commands will be strictly carried out by these units, whether acting alone or in conjunction with other units.

When operations involving large forces and concentrated efforts are necessary in order to carry out the strategy within the areas in question, the methods to be adopted will depend on the orders of the commander-in-chief of the operations as a whole. In cases where remnants of the enemy within these areas are to be mopped up, or where the troops are to be used for the maintenance of order, these tasks will be carried out according to the plan of the guard-force or garrison-force commanders.

(2) The guard-force command will make the plans for the defense of the areas under its control, plan the distribution of manpower, guns, boats, and weapons, establish a system of defense, give the orders for carrying out a successful defense, and generally prepare for battle.

(3) The guard forces will, conditions permitting, carry out mopping-up operations within the area, particularly against enemy communication facilities. At the same time they will extend the zone of our influence.

(4) The guard forces will, taking into account local conditions, establish observation posts and communication centers, and send out patrols. Communications will be established as quickly as possible; this is one of the most important factors in a successful defense.

(5) Protection of sea-borne traffic depends largely on ships and planes, and will be under the control of the superior commander. The guard-force commander and the garrison-force commanders will devote careful attention to the conditions of enemy and friendly sea lanes within their areas, and inform approaching friendly ships of these conditions. Also, the commanders will assist in guarding ships entering and leaving port, taking on or unloading cargo, and at anchor.

(6) In case friendly ships are present within their zone of command, the base forces and guard forces will, as the home force, assist the ships in carrying out their strategy, replenish supplies, and enable them to get some rest, etc. This is one of the most important points in carrying out the strategy of the Imperial Forces, and in manifesting their cooperation. The advancement of war strategy in this area depends largely on the work of the air force, and cooperation is therefore doubly important.

(7) In case there should be an airbase in the area, the air defense organization and patrol will be under the command of the air force; but the guarding of the area and the AA defense will be the duty of the guard force. Therefore, it is necessary to assist the air force in building up a speedy system of communications for patrol work.

(8) In case a friendly force under a different command stops in the area, it is necessary for the commanders to assure cooperation by reaching an understanding regarding any operations and by making clear the responsibilities of each.

(9) Keep the communication instruments always in a state of perfect preparation. In case they are not prepared, you must be ready to handle important communications swiftly and surely by such auxiliary means as flags, signal fires, and rockets.

In the case of reports and messages, you must not, by vainly concentrating on speed of delivery at the expense of essential accuracy, cause superior officers and friendly forces to err in their dispositions. Speed is to be sought after having prepared the important points of the message (for example, with regard to attack of enemy planes; --the number of planes, types, direction of attack and withdrawal, results, damage, etc.), and having made the text simple and clear.

(10) It is the duty of the superior officers to see that guard forces in remote outlying districts get necessary reports and suitable supplies, medical care, etc. However, since there are many cases when it is not easy to do this on account of the conditions of communications and tactical situation, each unit must do its best to improvise as required, and each commander must advance of his own accord and strive to grasp the general situation.

c. Internal Duties

(1) The daily routine depends upon the orders of the superior commander, but there is nothing to prevent the guard-force commander from making changes in accordance with the military situation, the work being done, the weather, etc. In short, it is most essential to promote a bright, interesting, pleasant life in the field: on the one hand, by planning an appropriate daily routine, weekly routine, and work schedule, thus achieving the best and most efficient plan for every sort of situation; and, on the other hand, by appropriate training, rest, and recreation.

(2) Leisure time should be utilized to the fullest possible extent in ardent training which should be carried out realistically. Also, encourage proficiency in military arts and athletics. This is the best way to improve and refine the efficiency of the whole force, make it energetic, and promote discipline and morale. The commanding officer must always give thought to these matters and not neglect to put them into practice.

When activities against the enemy are comparatively simple, "spiritual laxity" may easily arise before you know it in the environment of the front lines. It exhibits itself first in careless dress and sloppy saluting; then, in not a few cases, discipline relaxes and fighting power is lowered, so attention is required on this point.

(3) In combat, and in everyday training and duty, it is most essential both for the display of the force's military strength and for the promotion of efficiency in every sort of work that the officers be among the ranks, leading and supervising. Because the effect of this is to form a crack unit in which officers and men are harmoniously united, it is traditionally a virtue of the Imperial Navy. In forces engaged in operations and in front-line duty, the officers must give attention to this point.

(4) In operations in the pestilential and torrid tropics, great care is necessary to avoid losses due to sickness, particularly the epidemic diseases peculiar to these regions. The points to which this force should pay attention in the various areas which it guards are as follows:

(a) Divide up the area occupied by the units, and the important places of the vicinity, and within these areas and, insofar as possible, outside of them, make it impossible for disease-carrying insects to appear or spread. (We refer you to the results obtained in the area at Rashun taken over by the navy after the invasion, where mosquitoes were virtually eliminated after 2 1/2 months and the sanitary situation greatly improved).

(b) Always get rid of waste water, and do not permit even a small amount of stagnant water to stand in empty tin cans.

(c) Always cut weeds short, and try to see that air circulates well through the trees.

(d) All garbage is to be transported to an established place at some distance and disposed of. Combustible matter is to be burnt every day.

(e) When there are damp areas with poor drainage in the vicinity, quickly devise means of draining them,and also cover them with waste oil.

(f) Men must sleep under mosquito netting.

(g) When moving about in the bush, be especially careful about your clothes (do not have your legs exposed, and if necessary use an anti-mosquito mask and gloves), and when resting or going to bed take strict precautions against mosquitoes.

(h) Follow strictly medical directions as to the taking of preventive medicines.

(5) The commanding officer of a remote guard force must take care to report to his superiors without delay the tactical situation, and also from time to time the general situation, health conditions, and other essential matters. Also, he must be alert to utilize boats and airplanes for the transmission of reports, orders, etc., to keep his force fully supplied, to maintain close liaison with his superior officers, and to prevent delays in the military preparations and ordinary duties of his own unit. In case of wounds or sudden illness in a force which has

no doctor, the commanding officer is to get instructions quickly by message.

(6) Enemy property and captured goods must be properly disposed of in accordance with the various regulations. For this reason the commanding officer is to be conversant beforehand with the rules concerned. There is nothing to prevent the force from requisitioning and using whatever it needs from enemy produce, boats, houses, furniture, etc.; however, since the chief items, such as radio stations, power plants, etc., must be treated as national property from now on, you must report on their condition and strive to repair and preserve them.

(7) You should utilize spare time from duties to cultivate vegetables and fruit trees, and to raise chickens, pigs, etc., thus giving some ease and interest to your life and supplying some of your own provisions.

d. Treatment of Natives and Foreigners

(1) The natives of this area are in general simple and docile and tend to respect their masters. Each village is controlled autonomously under its chief (sometimes there is a main chief over the chiefs of a certain area or a number of villages), and if you can get the chiefs to direct the people favorably, it will make control comparatively easy and contribute a good deal of efficiency to labor conditions.

On the other hand, because of the past system of control, they have the habit of asserting their rights (they easily forget their duties), and many of them, having been affected by church education and being led by white missionaries, persist in those manners. The following points should be the general standard in leading and handling the natives:

(a) By the application of the authoritative and strict rules of the Imperial Army and by judicious direction, bring them to give us true respect and obedience. Induce them to become Japanese subjects. Make them realize that the Imperial Army will protect their lives and property, and that at the same time they must faithfully perform their duties.

(b) Prohibit the religious teaching (usually accompanied by schooling) which they have hitherto had from the white missionaries, but do not restrict the individual faith of the natives.

(c) Although you may make every effort to instill them with the Japanese type of spiritual training in its entirety, it will be hard for them to understand and usually there will be no results. For the present, make them understand well the great power and prestige of Japan and the superiority of the Japanese race, and bring them to trust us, admire us, and be devoted to us.

(d) Although the administration of justice is controlled by the civil government, the rendering of fair decisions in unimportant local matters will contribute to public order. Be especially careful that there are none among them who, through contacts with or induced by Europeans and Americans, give aid to

the enemy. In such cases take severe measures, and when the offense is serious seek the direction of higher authority.

(e) Do not enter their dwellings nor chat with them on a level of equality.

(f) In view of the fact that they respect their women and have the custom of taking a fierce and daring revenge for offenses against them, never approach the native women.

(g) Since they respect property, always pay a proper price for things, and especially pay them properly when they have finished their work. In this matter follow the regulations of the civil government.

(h) Choose the chief carefully, respect and support his position as intermediary, and make him display his authority and ability in directing the people.

(i) Try to have labor and service carried out under the orders and direction of the chief; it is necessary that supervision be strict. Use experienced natives for the sanitary improvement set forth in paragraph 4 of part c. above. Furthermore, in view of the fact that under the old regime, the natives used to work twice a week on the nearby roads under the direction of their chief, and this was considered a duty, have them continue the custom.

(2) The Chinese are scattered about in the various areas to be controlled, living in small communities, and making use of their characteristic commercial talents to gain an economic foothold. In not a few cases they exploit the natives' labor. We may make use of the trades and business agencies of those who cooperate with us in good faith; however, in view of the actual situation in this area, where there are no remaining Japanese residents, the Chinese must not be permitted to extend excessively their economic foothold.

(3) Enemy aliens who are hostile are naturally to be dealt with according to regulations. However, in the case of those who are not hostile and who honestly wish to cooperate with us, investigate them and seek the instructions of higher authority.

(4) The missionaries and Axis nationals (those remaining are mostly Germans) insist on being treated as priests and citizens of allied nations and, on the surface, promise to cooperate with us, but the real intention of many of them is to maintain their former rights, profits, and foothold, and to extend their businesses and try to prepare for the period after the war. Investigate them very strictly and, without being excessively high-handed on the surface, direct matters in such a way as to emasculate gradually their power, interests, enterprises, etc. If necessary, seek instructions from higher authority. Base your relations with, and treatment of, these people on the following standard:

(a) Under the former regime the churches and their institutions were recognized as a form of the national government. As part of Imperial territory, their churches and their proselyting and education are now to be prohibited.

(b) Under the former government, with the exception of land belonging to the churches, private ownership of land was not recognized, and all enterprises relating to land were regulated by a lease granted for a definite period of time. For this reason the property and enterprises of the churches cannot be permitted to continue in their present status of vested interests. Of course, that which is already clearly private property is to be respected.

(c) At the beginning of this war, the Australian government rigorously selected from among the missionaries of Axis countries those who showed real sincerity in cooperating with Australia and who promised never to aid the enemies of Australia during the war; these were allowed to remain. At present there are quite a number of Germans and Italians who have been sent to Australia and detained there. Accordingly, there is a good deal of doubt about letting the present Axis missionaries simply go on exercising their special rights in our occupied areas, as "religionists" under international law.

(d) In case there is argument regarding the grounds and procedure in the above paragraphs, avoid entering deeply into vain discussions and seek instructions from higher authority.

e. Military Administration

The government of the occupied territories is in the hands of the Japanese civil administration, but, since the guard force must cooperate with and assist the civil authorities, we summarize here the essential points of the military administration policies of this force.

(1) Government

(a) This force will try to extend military administration over the occupied areas and to control them, quickly eliminating any hostile activity and restoring public order and discipline. Also, the force will devise means of self-support, and search for and secure important defense materials.

(b) Root out the white man's influence by the policy of controlling important points with the power of the Imperial Forces, and gradually extend the power of the administration over the whole area.

(c) Govern the natives, with the chiefs as the core of local autonomous government, under the direct guidance of the civil authority or a substitute organization. We may use carefully selected white men who cooperate with us and swear loyalty for this purpose.

(d) The churches and church-supported education of the old regime is prohibited. Respect the religious faith, customs, and private property of the natives. Guide the masses of the people so as to make them gratefully contented with the prestige and authority of the Imperial Forces; make them return quickly to their occupations and cooperate actively with our policies.

(e) Always endeavor to mollify the masses with propaganda and to make them understand the meaning of our policies. Drive home the fact that it is natural that in war time the special demands of production, and the monetary and labor policies, should occasion heavy burdens to the people. Make them realize that behind the favors and the soothing propaganda is the might of the brave Imperial Forces, and that they have no other course than to rely on us and co-operate with us.

(f) Endeavor to restore and utilize the native constabulary system of the former government. Prohibit entirely the carrying of weapons by the natives.

(g) Restore the native public schools as quickly as possible, and give instruction with suitable persons as teachers. Furthermore, make propaganda capital out of giving the natives free medical service insofar as the exigencies of the war permit.

(2) Development of Industry and Expansion of Production

(a) For the present the first thing in the development of industry is to meet the requirements for the support of the force and of the various policies adopted, and at the same time to get as much as possible of the products of the land to help out the "Materials Movement Plan in Japan."*

(b) Do all you can to get the men and materials needed for development from local resources. Endeavor to use the labor of the natives, and try to make practical use of local facilities and materials.

(c) The land and all natural resources are government property, and, for the present, private ownership of them will not be recognized.

(d) The leasing, renting, and developing of government lands and resources will be permitted in the case of influential, trusted Japanese commercial firms. (All matters under this paragraph will be executed by the civil administration.)

Permits granted in this area at present are as follows:

Nanyo Bocki Kaisha (South Seas Trading Company)
Nankyo Suisan Kaisha (Southern Development Marine Products Company)

(e) The expansion of production for the present will emphasize materials necessary to military operations and the production of provisions necessary for the support of the force. Otherwise, expansion will be managed according to the

* The Materials Movement Plan is evidently designed to effect the movement of raw materials, such as iron ore, petroleum, manganese, nickel ore, and bauxite, from the occupied areas to Japan.

"Industrial Development and Production Expansion Plan,"* established by the civil government. Apart from the above, the securing and investigation of essential resources are in the hands of the civil government.

(3) Finance and Currency

(a) For the present, war notes** will be the currency.

(b) In view of the fact that financial and monetary problems will have a serious effect on the future government, everyone will follow the policies fixed by the civil administration and endeavor to be economical.

*The Industrial Development and Production Expansion Plan is probably that part of Japan's economic policy which is concerned with obtaining the raw materials for the Materials Movement Plan, as well as rehabilitating and developing local industries to producing goods for local military needs.

** Special currency issued in occupied areas.

SECTION III

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TACTICAL AND TECHNICAL TRENDS, ISSUES 11-20 (INCLUSIVE)

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TACTICAL AND TECHNICAL TRENDS, ISSUES 11-20 (INCLUSIVE)

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ANTIAIRCRAFT

ARMORED FORCE

ARTILLERY

CHEMICAL WARFARE

INFANTRY

Britain

Germany

Italy

Japan

UNCLASSIFIED

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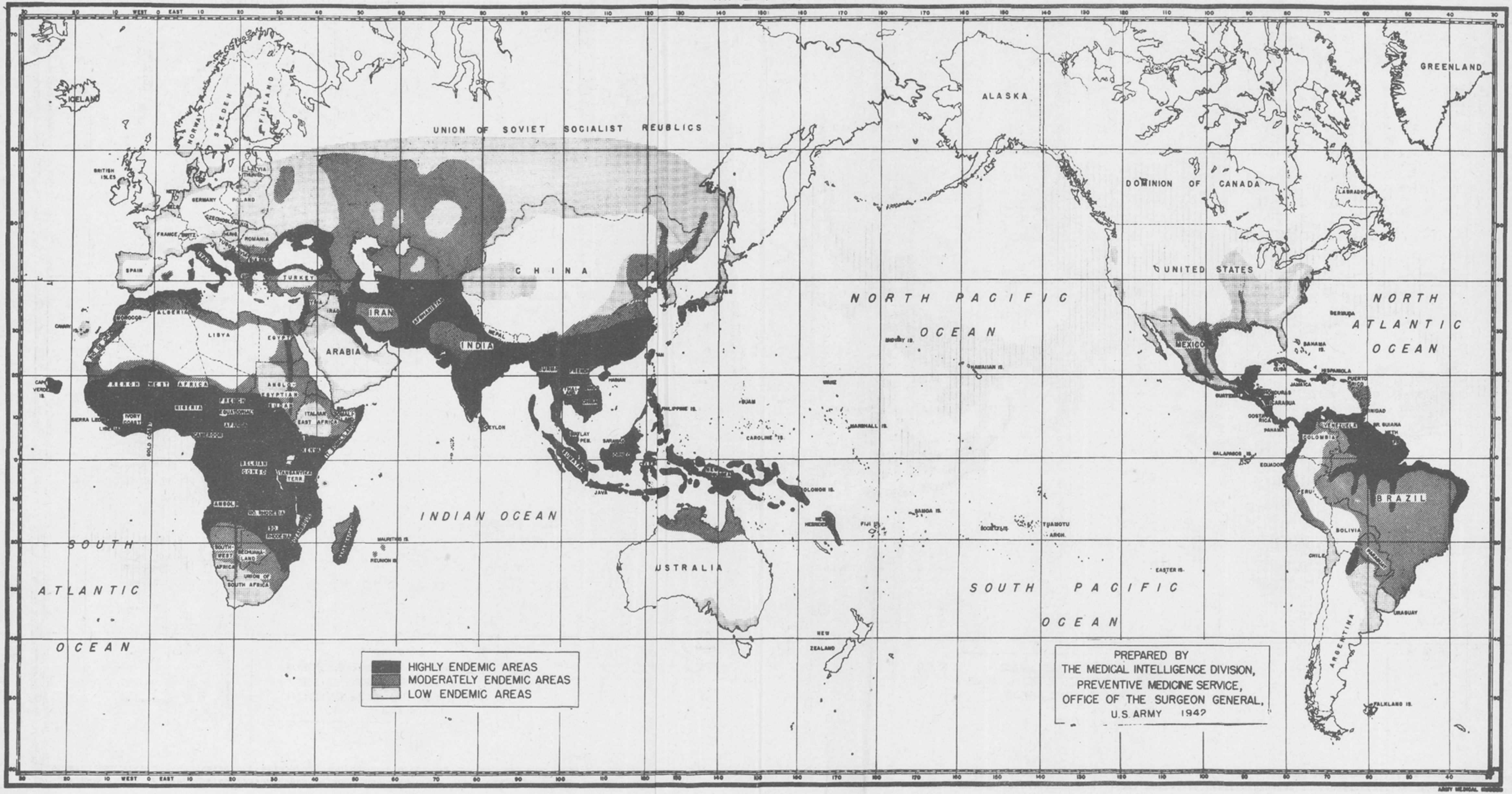
CORRECTIONS

No. 13, p. 31: Two paragraphs on this page, the third full paragraph and the last paragraph, tend to give the impression that the tanks of German armored forces operate independently and without the support of other arms. This, of course, is erroneous, since, as has been indicated elsewhere in *Tactical and Technical Trends*, isolated tank units become extremely vulnerable. It is true that, in the Battle of France, German tanks occasionally outstripped their own infantry and support columns by tens of miles. However, since then, the campaigns in Russia and North Africa have shown that the tactics used by all armies are to maintain the closest possible contact between fighting echelons of tanks and infantry, and other support echelons. Neither in attack nor defense do tanks function independently of infantry, antitank, and artillery support; all these units are part of a combat team. It is noteworthy that defensive tactics against armored formations are now based on an effort to *split* tanks from their support echelons.

MALARIA


HIGHLY ENDEMIC AREAS
MODERATELY ENDEMIC AREAS
LOW ENDEMIC AREAS
PREPARED BY
THE MEDICAL INTELLIGENCE DIVISION,
PREVENTIVE MEDICINE SERVICE,
OFFICE OF THE SURGEON GENERAL,
U.S. ARMY 1942
UNION OF SOVIET SOCIALIST REUBLICS
CHINA
ALASKA
GREENLAND
ICELAND
DOMINION OF CANADA
UNITED STATES
MEXICO
BRAZIL
INDIA
IRAN
ARABIA
TURKEY
SPAIN
FRANCE
GERMANY
POLAND
ROMANIA
LIBYA
EGYPT
ALGERIA
FRENCH WEST AFRICA
NIGERIA
BELGIAN CONGO
ANGOLA
UNION OF SOUTH AFRICA
NORTH PACIFIC OCEAN
SOUTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
USTRALIA
NEW ZEALAND
BOLIVIA
ARGENTINA
CHILE
COLOMBIA
PERU
URUGUAY
VENEZUELA
CEYLON
JAVA

DATE DUE (DA Pam 28-30)

16#07			

COMMAND AND GENERAL STAFF SCHOOL
Fort Leavenworth, Kansas

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1. Books, pamphlets, and periodicals must be charged at the loan desk (signature on book-loan card) before being taken from the Library.

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(1) Material issued to classes as a whole.

(2) Material issued to instructors for professional use.

(3) New books which are in demand must be returned within one week.

(4) Books required for faculty use are subject to recall at any time.

(5) All persons having library material in their possession will return same before leaving the post permanently.

(6) Books loaned outside the School must be returned within two weeks.

3. Reference books and current periodicals will not be removed from the library.

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